THE GENUS *STRIGA* (SCROPHULARIACEAE) IN AFRICA[1]

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ABSTRACT

Twenty-eight species and six subspecies of the hemiparasitic genus *Striga* Lour., witchweed, occur in Africa. Twenty-two species are endemic. Witchweeds occur throughout the continent with greatest diversity in the grasslands and savannas north of the equator. *Striga gesnerioides* (Willd.) Vatke and *S. hermonthica* (Del.) Benth. have developed host-specific strains that may have distinct morphotypes. We accord these no formal taxonomic status. *Striga hermonthica* and *S. asiatica* (L.) Kuntze, limited to agroecosystems, may be recently derived from non-ruderal species. *Striga hirsuta* Benth. and *S. lutea* Lour., sometimes treated as conspecific with *S. asiatica*, are recognized as distinct species restricted to natural ecosystems. *Striga linearifolia* Hepper, with its strongly bilabiate corolla and perennial habit, is considered as a subspecies of *S. bilabiata* (Thunb.) Kuntze. *Striga baumannii* Engl. and *S. fulgens* Hepper are excluded from the genus. *Striga baumannii* has tuberous roots and a ligneous calyx and may represent a distinct genus. *Striga fulgens*, with free petals, is aligned with *Chascanum* E. Mey. in the Verbenaceae.

Key words: Africa, Scrophulariaceae, *Striga*, witchweed.

Globally, witchweeds have a greater impact on human welfare than any other parasitic angiosperms because their hosts are subsistence crops in areas marginal for agriculture. They are also among the most specialized of all root-parasitic Scrophulariaceae (or Orobanchaceae, depending on how the families are circumscribed). Some members of the Scrophulariaceae are holoparasitic (without chlorophyll); most are hemiparasites (with chlorophyll). *Striga* combines life styles of both with a holoparasitic seedling and a green, chlorophyll-containing emergent plant. These furtive pathogens attack their hosts underground and, by the time the flowering stem of the parasite emerges and is evident, the crop is damaged. This occult behavior may be the source of the Latin name, "Striga," meaning "hag" or "witch." In this way, hosts are "bewitched" because the farmer is unaware of the parasite until it comes up. Due to the serious injury they inflict, witchweeds have been the targets of many control strategies. Helpful reviews of control measures and other aspects of witchweed biology are found in Sand et al. (1990), Sauerborn (1991), Parker and Riches (1993), and Press and Graves (1995).

Because witchweeds are parasitic and not totally dependent upon leaves, no exclusively vegetative stems are produced. In other words, each stem bears an inflorescence. Flowers are usually showy, in some cases spectacular. Most species that have been studied are autogamous (e.g., Musselman & Hepper, 1986), although *S. hermonthica* and *S. aspera* (Willd.) Benth. are outcrossers (Aigbokhan et al., 1998). Seed production is prodigious. Conditioning, germination, parasitic contact, and penetration are mediated by elegant systems of chemical communication between host and parasite (Parker & Riches, 1993; Press & Graves, 1995; Maass, 1999).

Witchweeds tolerate a relatively wide range of climatic and soil conditions. They grow in areas with annual rainfall ranging from 25 to 150 cm per year with a decrease in the severity of infestation in areas with higher rainfall (Musselman & Ayensu,

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1984). Optimum temperature for seed germination is between 30°C and 40°C, with no germination at 15°C or lower, or higher than 45°C (see review of literature in Parker & Riches, 1993).

Phenology among the different species of *Striga* varies. In a given area, there is a progression of appearances from the onset of the rains to the end of the rainy season. For example, in the Southern Kordofan region of Sudan, the first *Striga* to appear is *S. forbesii* Benth., followed by *S. passargei* Engl.→ *S. aspera*→ *S. gesnerioides*→ *S. hirsuta*→ and lastly, *S. hermonthica.*

In general, low soil fertility, nitrogen deficiency, well-drained soils, and water stress accentuate the severity of *Striga* damage to the host. These are typically the environmental conditions for *Striga*-hosts in the semiarid tropics (Sauerborn, 1991; Parker & Riches, 1993). *Striga* usually causes less damage to hosts growing on fertile, deep soils.

Striga is distinguished from other genera in the subfamily Rhinanthoideae of the Scrophulariaceae by bilabiate corollas with a pronounced bend in the corolla tube, and unilocular anthers. The corolla feature distinguishes *Striga* from related *Buchnera* L. in which nine *Striga* species were once included. Based on this feature, the genus *Striga* was erected by the Italian botanist Loureiro in 1790 as distinct from *Buchnera,* which has a salverform corolla. Little data are available on seed structure in *Buchnera,* but Musselman and Mann (1976) reported secondary ornamentation of *Buchnera americana* L. similar to that of *Striga asiatica. Buchnera* germination and seedling development are also much less specialized (Parker & Riches, 1993). Lastly, *Buchnera* is found in both the New and Old Worlds, while *Striga* is strictly Old World.

Recent molecular work supports the long-assumed relationship between *Striga* and *Buchnera.* Olmstead et al. (in press), using three plastid genes, show *Buchnera floridana* Gandoger (= *B. americana*) and *S. asiatica* as sister taxa. Further work is needed to determine the relationship between *Alectra* and *Striga.* Unlike *Buchnera, Alectra* species require a germination stimulant and have a holoparasitic seedling stage.

All witchweeds are African except the following: *S. curviflora* Benth. (Australia, New Guinea), *S. densiflora* (Benth.) Benth. (India), *S. masuria* (Buch.-Ham. ex Benth.) Benth. (= *S. flava* Miq.?, *S. esquirolia* Lév.?) (China, India, Indonesia), *S. multiflora* Benth. (Australia), *S. parviflora* Benth. (Australia), and *S. sulphurea* Dalz. ex Dalz. & Gibbs (India). Our understanding of the genus in Africa requires a better knowledge of these species.

Taxonomic studies at the genus and tribal level are few. Wettstein (1891) divided *Striga* into two sections: the *Pentapleurae,* which have a 5-ribbed calyx, and the *Polypleurae,* characterized by approximately 10-calyx ribs. Later, Engler (1897) created the section *Tetrosepalum* to include *S. baumannii.* Saldanha (1963) noted that the number of ribs is inconsistent within species. In spite of this, rib number has remained as the only infrageneric character.

Figures 1 and 2 illustrate the general features of witchweeds.

Following is a summary of features helpful in determining *Striga* species.

1. Duration. Striga species are annuals or perennials. Duration may help identify plants in the field, but it is of limited value for herbarium specimens, especially when roots are lacking. All agronomically important species are annuals, perhaps because their hosts are also annuals. The exception is sugarcane (*Saccharum officinarum* L.), which is perennial. In natural grasslands witchweed species do not seem to affect their hosts the same as cultivated crops; damage is not evident. Perennial species produce fleshy underground rhizomes or tubers that bear scale leaves from which new stems arise annually. Generally, perennial species have reduced or narrow stem leaves. See Raynal-Roques (1993) for a helpful discussion of duration in witchweeds.

2. Stem shape. Three stem types can be distinguished. Terete stems are round in cross section, obtusely square stems are square with blunt corners, and winged stems are square and acutely angled. A furrowed stem has grooves parallel to the long axis.

3. Indumentum. Indumentum types, both surface features and trichomes, are diverse. Many species have scabrous leaf and stem surfaces at maturity. The most common trichome types include: glandular trichomes; stiff hairs (hispid); long soft hairs (pubescent or pilose); long stiff hairs (ciliate) (Neumann et al., 1996).

4. Leaf lobing, dentation. Leaves of most species are unlobed, and only a few have teeth. Venation may extend to the tips of leaves in a few species.

5. Inflorescence. Inflorescence types include solitary flowers, spikes, and racemes. The length of the inflorescence compared to the vegetative part of the stem (longer or shorter); compactness of the flowers (lax or dense); and bract size and shape (similar to or different from stem leaves) are also helpful distinguishing features. Bracteoles are present just above the floral bract. Flowers can be opposite or alternate on the inflorescence. In almost

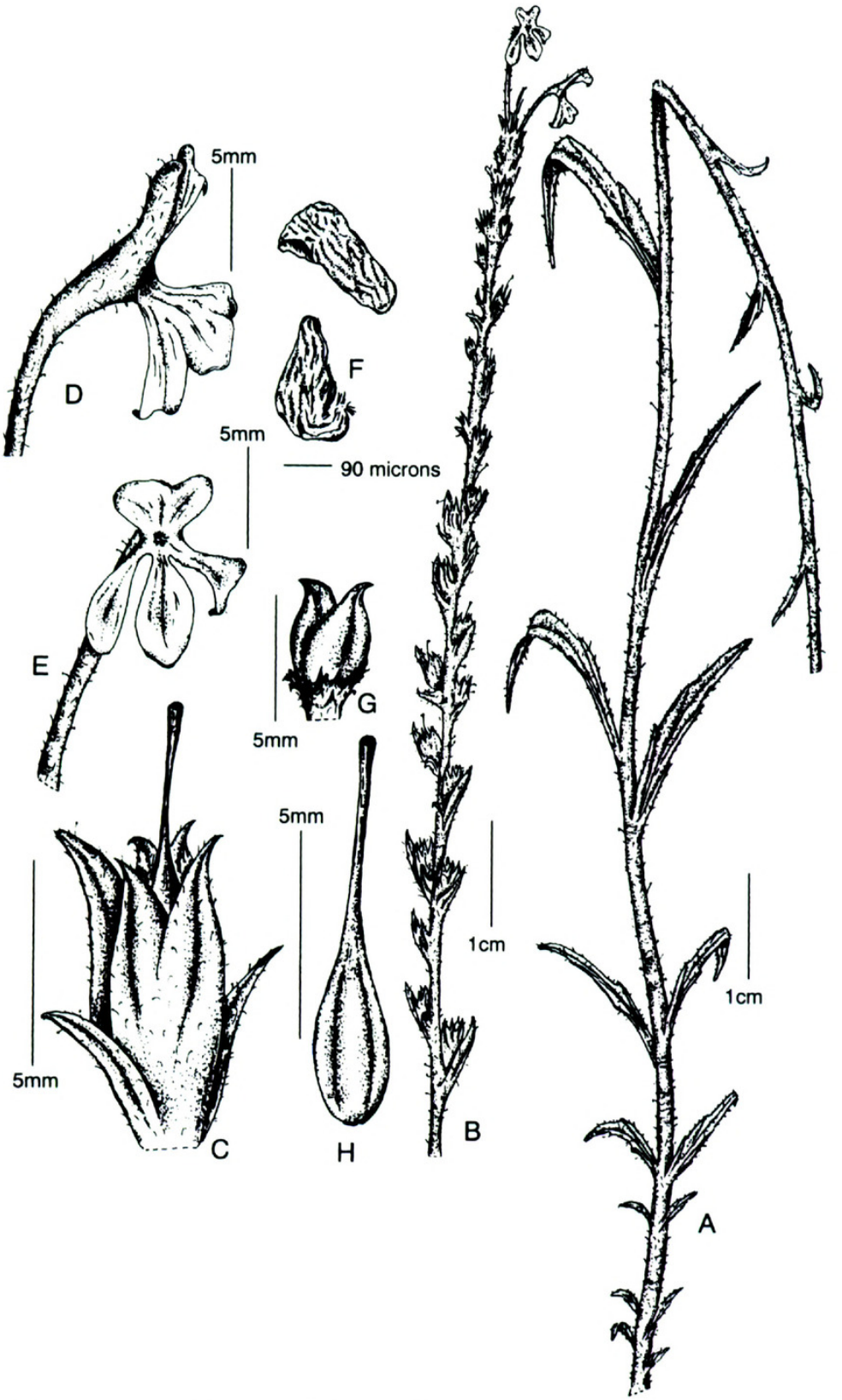

Figure 1. *Striga angolensis* K. I. Mohamed & L. J. Musselman. —A, B. Habit. Note the reduction of leaves acropetally and basipetally. —C. Calyx. Two bracteoles are evident, with the much larger bract on the left. This calyx has four lobes. —D, E. Corolla. —F. Seeds. —G. Capsule. —H. Pistil. (*R. G. N. Young 1365*, MO). Drawing by Karillos Karillos in Mohamed and Musselman, Brittonia 49: 118–121. 1997.

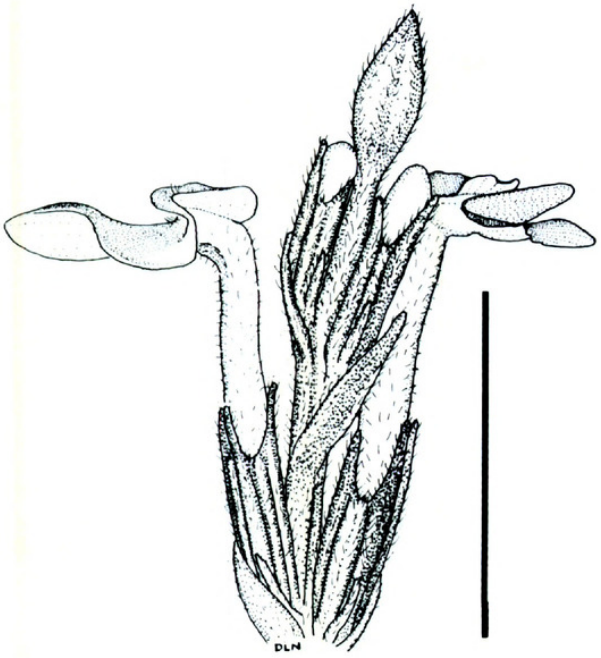

Figure 2. *Striga hirsuta* (Benth.) Benth. Note bract and bracteole, lower left. *Musselman & Mansfield* 5531 (ODU). Drawing by Daniel L. Nickrent from Musselman et al., Sida 8: 196–201. 1979. (Originally determined as *S. asiatica* (L.) Kuntze.) Scale = 1 cm.

all species the 2 to 4 pairs of lower bracts at the base of the inflorescence are longer than the upper bracts and are described separately.

6. Calyx. Calyx lobes can be equal or subequal. In some species the adaxial lobe is reduced.

7. Corolla color and tube bend. Most witchweed corollas are red or white, but they can also be salmon, orange, or yellow. The bend in the corolla tube can be positioned distally or proximally. If proximal, it may be within the calyx teeth. If distal, it is closer to the corolla limb. Fragrance has been reported only in *S. hermonthica* (Musselman & Hepper, 1986).

8. Hosts. Witchweeds have one of the narrower host ranges of any parasitic Scrophulariaceae. Not surprisingly, hosts of agronomically important species are better documented than hosts of native species. Most *Striga* species, however, have not been critically examined for host range and host specificity. Except for *S. gesnerioides*, which is restricted to dicots, these hosts are all Poaceae with the odd connection to non-grasses noted, disproportionately, by collectors. Great caution is advised when ascribing any form of host specificity to root parasites. It is essential that the host-parasite connection be located, not that hosts be inferred from proximity. Further, it is virtually impossible to determine how many different plants, perhaps different species, are attacked by a single witchweed.

Too few studies on other features of witchweeds are available, including cytology. Reported chromosome numbers have varied widely, from $n = 18$ to $n = 40$ (reviewed in Aigbokhan et al., 1998). Careful cytological studies are needed to clarify the counts. Ultrastructural studies are also limited. Pollen has few useful features, at least in the species studied (DeLeonardis, 1986; Minkin & Eshbaugh, 1989). Current taxonomy is based almost exclusively on morphology.

Seed size and structure have been used to separate *S. angustifolia* from other species because of its larger seed size and its germination without a host stimulus (e.g., Parker & Riches, 1993). Secondary ornamentation of *S. angustifolia* is also distinct from other species (Musselman & Parker, 1981). However, in a survey of nine species, no other consistent seed ornamentation features were found to separate species (Musselman & Parker, 1981).

A conspectus of the genus on a continent-wide basis is important for agricultural researchers, among others, to enable the determination of new parasite problems. Certainly, future expansion of food crop species possibly susceptible to parasitism by witchweed should take into account indigenous *Striga* species that could potentially attack crops. There are several examples where this has occurred. These include maize planted in the KweKwe region of Zimbabwe (Knepper et al., 1991) where *S. forbesii* occurred. Another is the planting of sugarcane in Ethiopia, which was attacked by *S. latericea* Vatke (Parker, 1988). Moreover, meaningful quarantine measures depend on knowledge of the distribution of the parasite.

A study of *Striga* taxonomy invites comparison with the taxonomy of the other, agronomically significant genus in the family (assuming parasitic Scrophulariaceae and Orobanchaceae are monophyletic, e.g., Nickrent et al., 1998; Young et al., 1999). This is *Orobanche*, the genus of broomrapes.

Historically, broomrapes have suffered from extreme splitting and the establishment of varieties, forms, and even subforms based largely on herbarium studies with little consideration of host-induced variation. Thus, a plethora of names encumbers the taxonomy of the group. Unlike *Orobanche*, the cytology of witchweeds needs much additional work. Based on the limited data available, aneuploidy does not play a major role in witchweed speciation and variability. Some groups of broomrapes, on the other hand, exhibit aneusomaty, polyploidy, and parthenogenesis (Cubero, 1996). In short, the taxonomy of witchweeds is less daunting than that of broomrapes.

Despite the well-known impact of *Striga* on sub-

sistence crops in Africa, there is no single reference to the taxonomy and distribution of African taxa. The purpose of this paper is to describe all the reported taxa in Africa, map their distribution, record notes on their biology, and provide a key for their identification.

Maps of *Striga* collection sites were constructed using the *Britannica Atlas*. Collection sites were plotted on a large computer-generated map (Anonymous, 1996).

Striga Lour., Fl. Cochinchinensis 1: 22. 1790. TYPE: *Striga lutea* Lour.

Annual or perennial, herbaceous hemiparasites. Stem: stiffly erect, square or terete, ridged in some species. Indumentum: hirsute or pilose, scabrid, glandular pubescent; rarely glabrate. Leaves: opposite or subopposite, rarely alternate, reduced to small scales at the base of the stem in all species. Inflorescence: dense or lax spike or raceme; rarely solitary. Calyx: tubular, with 4 to 8, usually 5, equal or subequal lobes. Corolla: divided into a tube and a limb, the tube cylindrical with an acute bend, the limb 2-lipped, with lobes fused at least at their bases to form a bilabiate corolla with 3 lower and 2 upper lips. Stamens: 4, didynamous, anthers dorsifixed, unilocular, dehiscence loculicidal. Pollen: with 3–4 colpi, 15–30 μm with 2 nuclei at shedding. Style: terete, elongate, and persistent. Capsule: oblong or subovoid, placentation axillary, dehiscence loculicidal. Seeds [except in *S. angustifolia* (Don) Saldanha]: dust-like, 0.35 × 0.20 mm, with prominent ridges that are ornamented. Germination: hypogeal and cryptocotylar [except in *S. angustifolia*]. Chromosome numbers ranging from $n = 18$ to $n = 40$. Hosts: usually Poaceae; few species restricted to dicots.

KEY TO THE AFRICAN *STRIGA* SPECIES

1. Calyx 4- to 5-ribbed (sect. *Pentapleurae*) 2
1′. Calyx 10- or more ribbed (sect. *Polypleurae*) 14
2(1). Lobes of lower lip fused to >50% of their length forming a strongly bilabiate corolla 3
2′. Lobes of lower lip fused to <50% of their length forming a weakly bilabiate corolla 4
3(2). Plant glabrate with few hairs on leaf margins and bracts; calyx ≤4 mm long ..... 1. *S. aequinoctialis*
3′. Plant pubescent or hispid; calyx > 4 mm long ..... 6. *S. bilabiata*
4(2). Leaf prominently 3-veined, leaf margin toothed 5
4′. Leaf veins obscure, not apparent, leaf margin entire 6
5(4). Calyx lobes twice as long as tube; leaf elliptic, shortly petiolate; corolla bright salmon-pink, tube 22–25 mm long ..... 15. *S. hallaei*
5′. Calyx lobes about as long as tube; leaf lanceolate, sessile; corolla mauve, tube 12–13 mm long ..... 2. *S. angolensis*
6(4). Plant succulent, usually branched from base (tufted); leaf reduced, ≤10 mm long, appressed 7
6′. Plant not succulent, unbranched or if branched then from middle; leaf large, > 10 mm long, ascending or spreading 9
7(6). Corolla densely pubescent, bent proximally within calyx teeth; lower corolla lobes lanceolate ..... 21. *S. lepidagathidis*
7′. Corolla sparsely pubescent or glandular-pubescent, bent distally above calyx; lower corolla lobes obovate 8
8(7). Plant glabrate, about 6 cm tall, perennial; corolla tube up to 8 mm long ..... 12. *S. gastonii*
8′. Plant sparsely to densely hispid or pubescent, > 10 cm tall, annual (except strain on *Euphorbia*); corolla tube 8–14 mm long ..... 13. *S. gesnerioides*
9(6). Calyx lobes deltate, < ½ the tube length, adaxial lobe reduced to < 1 mm 10
9′. Calyx lobes linear to lanceolate, > ½ the tube length, adaxial lobes > 1 mm 12
10(9). Herbage with dense retrorse hispid hairs; corolla retrorsely pubescent; leaf 1–2 mm wide ..... 28. *S. yemenica*
10′. Herbage with dense ascending hispid hairs; corolla with ascending hairs; leaf >2 mm wide 11
11(10). Plant branched; corolla > 10 mm long, lobes of lower lip 7–15 mm long, 3–6 mm wide; calyx tube 5–10 mm long ..... 16. *S. hermonthica*
11′. Plant usually unbranched; corolla < 10 mm long, lobes of lower lip 1–3 mm long, 1–1.5 mm wide; calyx tube 3–4 mm long ..... 14. *S. gracillima*
12(9). Corolla white (rarely pink or yellow); upper bracts as long as or longer than calyx; flowers sessile, spike longer than vegetative stem ..... 24. *S. passargei*
12′. Corolla pinkish purple; upper bracts shorter than calyx; flowers shortly pedicellate, raceme shorter than vegetative stem 13
13(12). Calyx tube 4–6 mm long; lower corolla lobes 4–8 mm long, 2–5 mm wide ..... 5. *S. aspera*
13′. Calyx tube 1.5–3 mm long; lower corolla lobes 2–3 mm long, 1–2 mm wide ..... 7. *S. brachycalyx*
14(1). Leaf pinnatifid; flowers solitary, few, axillary ..... 25. *S. pinnatifida*
14′. Leaf not pinnatifid; flowers in terminal raceme or spike 15
15(14). Leaf > 3 mm wide, with 2 to 5 prominent veins, margin toothed 16
15′. Leaf < 3 mm wide, veins obscure, margin entire 20
16(15). Corolla salmon-pink; lower bracts > 2 cm long; inflorescence lax at base 17
16′. Corolla pink or white; lower bracts < 2 cm long; inflorescence compact 18
17(16). Stem hairs stiff; lower bracts distinctly 3-veined, toothed; lower corolla lobes 6–9 mm long ..... 11. *S. forbesii*

17′. Stem hairs soft; lower bract veins obscure, entire; lower corolla lobes 10–15 mm long ..... 20. *S. latericea*
18(16). Leaf linear, base of hairs inconspicuous; bracts linear ..... 9. *S. dalzielii*
18′. Leaf elliptic or narrowly elliptic, base of hairs enlarged; bracts lanceolate 19
19(18). Corolla pink, tube 10–13 mm long; lower corolla lobes 4–7 mm long, 2–4 mm wide; leaf shorter than internode ..... 19. *S. klingii*
19′. Corolla white, tube 17–24 mm long; lower corolla lobes 7–10 mm long, 4–8 mm wide; leaf longer than internode ..... 23. *S. macrantha*
20(15). Corolla brilliant scarlet with yellow throat; flowers opposite in dense raceme ..... 10. *S. elegans*
20′. Corolla not brilliant scarlet; flowers alternate in lax raceme or spike 21
21(20). Corolla white or creamy white 22
21′. Corolla pink, purple, yellow, or dark red 23
22(21). Calyx 8–12 mm long; corolla tube 10–15 mm long, lower lobes 4–8 mm long, 2–4 mm wide ..... 3. *S. angustifolia*
22′. Calyx 13–21 mm long; corolla tube 27–35 mm long, lower lobes 14–20 mm long, 10–17 mm wide ..... 27. *S. pubiflora*
23(21). Calyx with at least 15 ribs; plant perennial 24
23′. Calyx with 10 ribs; plant annual 25
24(23). Corolla purple; leaf linear, ≥ 1 cm long; calyx 11–15 mm long, lobes 5, equal ..... 18. *S. junodii*
24′. Corolla yellow; leaf lanceolate, < 1 cm long; calyx 8–9 mm long, lobes 5, unequal ..... 26. *S. primuloides*
25(23). Leaf ≥ 15 mm long, longer than internode; lower bracts > 15 mm long ..... 4. *S. asiatica*
25′. Leaf < 15 mm long, shorter than internodes; lower bracts < 15 mm long 26
26(25). Corolla tube 20–25 mm long; calyx 8–15 mm long ..... 8. *S. chrysantha*
26′. Corolla tube < 15 mm long; calyx up to 6 mm long 27
27(26). Plant 6 cm tall (rarely 20); lower surface of leaf and bract with a single row of hispid hairs along margin and midrib; calyx lobes about equaling tube length ..... 17. *S. hirsuta*
27′. Plant up to 40 cm tall; lower surface of leaf and bract with two rows of hispid hairs along margin and midrib; calyx lobes ½ the tube length ..... 22. *S. lutea*

1. Striga aequinoctialis A. Chev. ex Hutch. & Dalz., Expl. Bot. Afr. Oc. Fr. 1: 476. 1920. TYPE: Guinea (Conakry). Montagne de Nzo, *Chevalier 21035* (holotype, P!).

Perennial, to 50 cm tall, slender, glabrate, usually simple or with 2 or 3 branches from below middle, stem winged. Leaves 10–24 × 1(–2) mm, filiform, sessile, decussate, ascending, shorter than internodes, hispid along margins, margin entire, veins obscure. Bracts 4–6(–12) × 1(–2) mm, linear, hispid along margins, incurved, longer than calyx. Flowers decussate in open spikes, spike shorter than vegetative stem. Calyx 5-ribbed, 3–4 mm long; tube 2–2.5 mm long; lobes 5, unequal, lanceolate, 1–2 mm long, slightly shorter than tube. Corolla pale mauve, tube 10–12 mm long, bent and expanded distally above calyx, retrorsely pubescent; lobes of lower lip 3–7 × 2–3 mm, ovate, tip acute, upper lip 3–5 × 4–7 mm, slightly notched, tip obtuse.

Restricted to the moist montane grasslands of west tropical Africa between 5°16′N and 11°0′N (Fig. 3). Known from Guinea, Sierra Leone, Liberia, and Ivory Coast with only one collection from outside West Africa, *Young 1300* (MO), from Angola. Like *S. bilabiata*, *S. aequinoctialis* has a bilabiate corolla, decussate leaves, slender stem, retrorsely pubescent corolla and shares part of the geographical range. *Striga aequinoctialis* is distinguished by its glabrous stem, filiform leaves, and small calyces. The calyx is the smallest in the genus.

Selected specimens examined. ANGOLA. **Lunda South:** Saurimo-Dala Road, 11°2′S, 20°12′E, *Young 1300* (MO). GUINEA. **Eastern:** Kankan, 45 mi. NW of Beyla, 9°11′N, 9°9′W, *Collenette 3* (K). **Southern:** N'Zerekore, 7°43′N, 8°50′W, *Adam 5111, 24653, 24386, 26054, 26531* (all MO). **Western:** Fouta Djalon, near Bandakure, SW of Pita, 11°0′N, 12°16′W, *Adames 284* (K). IVORY COAST. **Northwestern:** Odienne, Tienko, 10°5′N, 7°30′W, *Morton & Gledhill 18771* (K). **Southwestern:** Danane, Nimba Mountains, 7°34′N, 8°24′W, *Boughey 18052, 18067b, 180995* (all K). LIBERIA. **Nimba:** Mountain Nimba, 7°34′N, 8°40′W, *Adam 21457* (K, MO, UPS), *Vallah 65* (K); Grassfield-Nimba-Ideria, 6°45′N, 8°30′W, *Adam 25550* (K, MO). **Sinoe:** Jedepo, 5°16′N, 8°20′W, *Adam 24039, 27478* (MO). **Liberia:** *Adam 25592* (K). SIERRA LEONE. Bintinani, *Morton & Gledhill 1093* (K). **Eastern:** Sankanbiaiwa, 8°45′N, 11°0′W, *Cole 199* (K). **Northern:** Bumbuna to Farangbaia, 9°1′N, 11°44′W, *Deighton 5146* (K); Loma, 9°15′N, 11°2′W, *Anonymous 9783* (K). **Western:** Freetown, Mendi (Njamumu), 8°29′N, 13°0′W, *Burbridge 510* (K).

2. Striga angolensis Mohamed & Musselman, Brittonia 49: 118–121. 1997. TYPE: Angola. Vila Luzo, R. Luena, *Young 1365* (holotype, MO!). Figure 1.

Perennial, to 70 cm tall, stiffly erect, simple or with 2 or 3 branches from below middle, densely glandular-pubescent, stem obtusely square. Leaves (10–)20–35 × 2–8 mm, lanceolate, sessile, alternate, coarsely toothed, 3-veined, longer than internodes at the lower part of stem, becoming shorter above. Bracts 5–8 × 2 mm, abruptly different from leaves, lanceolate, shorter than calyx. Flowers opposite, lax at the base of inflorescence, dense toward the apex, spike shorter than vegetative stem. Calyx 4- or 5-ribbed, 6–8 mm long; tube 2.5–4 mm long; lobes 4 or 5, subequal, lanceolate, 3–5 mm

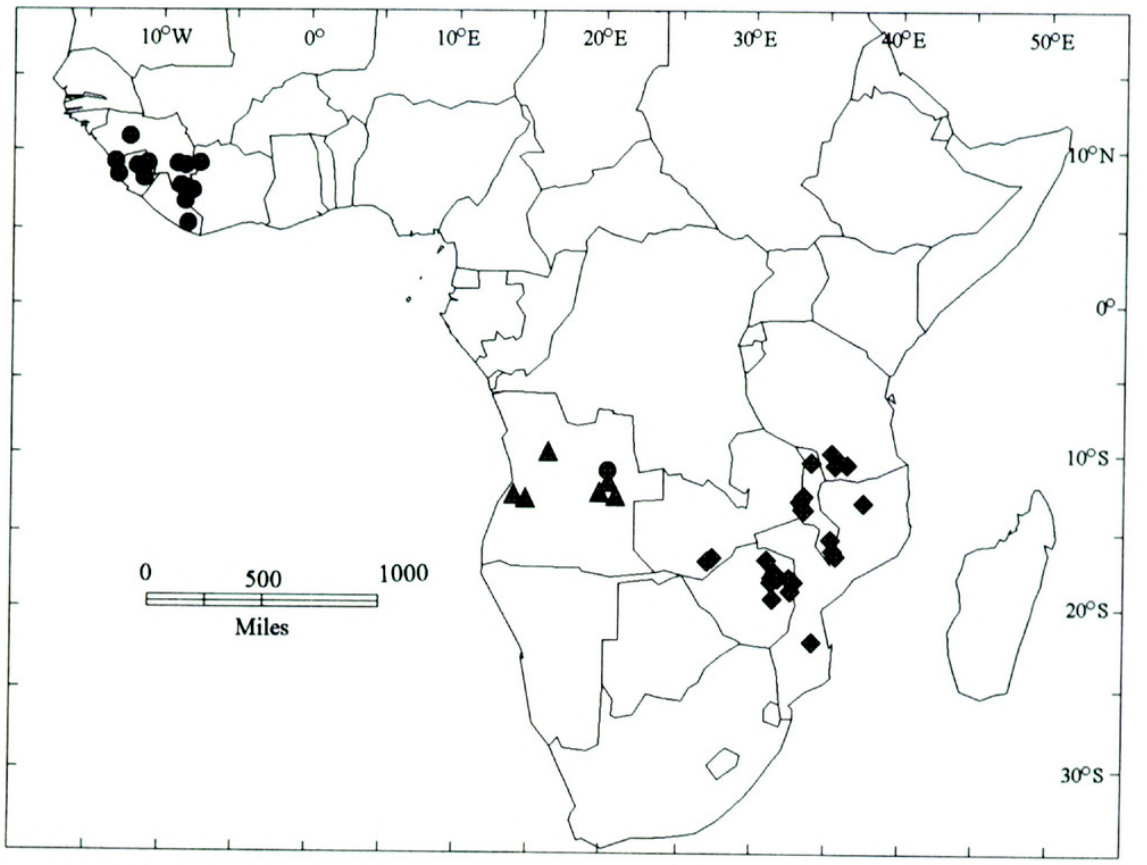

Figure 3. Distribution based on specimens of *Striga aequinoctialis* (circle), *S. angolensis* (triangle), and *S. angustifolia* (diamond).

long, as long as tube. Corolla weakly bilabiate, mauve, tube 12–13 mm long, bent and expanded distally above calyx, densely glandular-pubescent; lobes of lower lip 7–8 × 2 mm, obovate, upper lip 5 × 3 mm, obovate, slightly notched.

Striga angolensis is restricted to boggy grassland and wet areas in Angola between 9°48′S and 12°50′S (Fig. 3). Because there are numerous collections, we assume that *S. angolensis* was fairly common in this region, but we are not aware of any recent collections.

While many witchweeds are plants of dry areas, *S. angolensis* is part of a guild of witchweeds that inhabit wetlands, including *S. latericea*, *S. forbesii*, and *S. junodii* Schinz.

A statistical analysis of the genus (Mohamed, 1994) suggested that *Striga angolensis* is closely related to *S. hallaei* A. Raynal, *S. dalzielii* Hutch., *S. klingii* (Engl.) Skan, and *S. macrantha* (Benth.) Benth. They can be distinguished, however, on leaf and bract characters. *Striga angolensis* and *S. hallaei* are the only two *Pentapleurae* with prominently veined leaves, a feature common in at least six species in section *Polypleurae*. *Striga dalzielii*, *S. macrantha*, and *S. klingii* (sect. *Polypleurae*) differ from *S. angolensis* in having dense leafy spikes and leaf-like bracts that surmount the calyx, at least at the base of the inflorescence.

Selected specimens examined. ANGOLA. **Benguella:** Benguella, 12°36′S, 13°20′E, *Gossweller 3504* (K); Catumbela, 12°50′S, 14°40′E, *Faulkner A376* (K). **Lunda South:** small river between River Luachi & River Lumeji, 10°10′S, 20°12′E, *Young 1261* (ODU). **Malange:** Gando, 9°48′S, 16°10′E, *Faulkner A376* (K). **Moxico:** boggy grassland by River Chibamba, 12°40′S, 20°45′E, *Milne-Redhead 4161* (K); River Luena, Vila Luzo, 11°45′S, 19°50′E, *Exell & Mendonca 1353* (BM), *Young 1347* (BM), *Young 1365* (MO).

3. Striga angustifolia (Don) Saldanha, Bull. Bot. Surv. India 5: 70. 1963. *Buchnera angustifolia* Don, Prodr. Fl. Nepal: 91. 1825. TYPE: Nepal. *Wallich s.n.* (holotype, K!).

Annual, 10–50 cm tall, stiffly erect, unbranched or with 2 or 3 branches from below middle, pubescent or sometimes densely hispid with short upward curved hairs, stem obtusely square. Leaves 10–20(–30) × 1–3 mm, linear, alternate, as long as internodes, entire, veins obscure. Lower bracts 10–25 × 1–2 mm, leaf-like, longer than calyx, upper bracts subulate, shorter than calyx. Flowers alternate in lax racemes, raceme shorter than vegetative stem. Calyx 15-ribbed; ribs prominent, pilose, 8–

12 mm long; tube 3–6 mm long; lobes 5, equal, linear to lanceolate, 3–6 mm long, equal or subequal to the tube. Corolla creamy white with greenish tube, tube 10–15 mm long, bent and expanded distally above calyx, densely pubescent; lobes of lower lip 4–8 × 2–4 mm, obovate, upper lip 3–4 × 3–4 mm, broadly obovate, emarginate or truncate.

In Africa, *S. angustifolia* grows in the seasonally wet grasslands of Tanzania, Malawi, Mozambique, Zambia, and Zimbabwe between 9°52′S and 22°05′S (Fig. 3). It does not attack crops in eastern Africa, although it has been cited as a pest of cereals and sugarcane in India (Ramaiah et al., 1983). The occurrence of *S. angustifolia* in native grasslands and its absence in agroecosystems suggest it is indigenous to East Africa. *Striga angustifolia* is sympatric with and apparently related to *S. pubiflora* Klotzsch. and *S. junodii* (Mohamed, 1994). The Indian species *S. masuria* superficially resembles *S. angustifolia*, but the relationship between these two species has not been investigated. *Striga angustifolia* is widespread in India and Sri Lanka, and is known from a single collection in Oman. See Hepper (1986) regarding typification.

Selected specimens examined. MALAWI. **Central:** 6 km N of Kasungu, 12°55′S, 33°29′E, *Grosvenor & Renz 1038* (K); Kasungu Hills, 13°0′S, 33°15′E, *Jackson 2282* (K); Kasungu National Park, 13°35′S, 33°32′E, *Pawek 12015A* (K); near Tamanda Mission, *Robson 1094* (BM, K). **Northern:** Nyika Plateau, 10°30′S, 34°0′E, *McClounie 178* (K). **Southern:** Mount Mlanje above Likhubula, 16°5′S, 35°40′E, *Hepper 7368* (K); Saturi Stream, Likhubula Valley, Mulanj Mountain, 16°15′S, 35°27′E, *Chapman & E. G. 7186, 9000* (K); Zomba Mountain, Chivunde Valley, 15°30′S, 35°19′E, *La Croiz 2735* (MO); Zomba, 15°30′S, 35°19′E, *Hepper 7333* (K). MOZAMBIQUE. **Inhambane:** Mabote, 22°5′S, 34°5′E, *de Koning 7703* (K). **Niassa:** Marrupa, 13°8′S, 37°30′E, *Nuvunga 471* (K). TANZANIA. **Ruvuma:** just E Songea District Boundary, 10°42′S, 35°37′E, *Milne-Redhead & Taylor 10577* (K); Songea, 3 km W of Gumbiro, 10°15′S, 35°42′E, *Milne-Redhead & Taylor 10024* (K); S of Hanga River, 64 km from Songea on Njombe Road, also collected 120 km from Songea on Lindi road, Songea District, 9°52′S, 35°22′E, *Gilbert 17889* (K). ZAMBIA. **Southern:** 17 mi. NE of Choma, Brachystegia Wood, 16°40′S, 27°18′E, *Hutchison & Gilbert 3537* (K); Choma, 16°55′S, 26°59′E, *Robinson 1214* (K). ZIMBABWE. **Manicaland:** Inyanga, Cheshire, 18°15′S, 32°48′E, *Norlindh & Weimarck 4878* (K); Inyanga, Ghikori Reserve, 18°0′S, 32°30′E, *Masierson 217* (K); Umtali, Zimunya Reserve, 18°50′S, 32°37′E, *Chase 6854* (K). **Mashonaland North:** River Ruya, 16°50′S, 31°20′E, *Philcox & Drummond 9054* (K). **Mashonaland South:** Goromonzi, Kopje Domboshawa, 17°40′S, 31°34′E, *Philcox et al. 9093* (K); Goromonzi, Kopje Ngomakurira, 17°58′S, 31°22′E, *Philcox et al. 9127* (K); Lower Sabi, Videw, 19°20′S, 31°25′E, *Videw 8110* (K); Macheke, 18°0′S, 31°47′E, *Eyles 8799* (K); Marandellas, Charter Estate, 18°15′S, 31°20′E, *Cleghorn 2357* (K).

4. Striga asiatica (L.) Kuntze, Rev. Gen. Pl. 2: 466. 1891. *Buchnera asiatica* L., Sp. Pl.: 630. 1753. TYPE: Comoro Islands. St. Joanna, *Toreen s.n.* (LINN, photograph!).

Plant annual, up to 40 cm tall, stiffly erect, usually branched from middle, scabrous, hispid, stem obtusely square. Leaves (10–)20–50 × 1–3 mm, linear or narrowly elliptic, opposite, longer than internodes, margin entire, veins obscure. Lower bracts 15–35(–50) × 1–3 mm, leaf-like, upper bracts lanceolate, all bracts longer than calyx. Flowers alternate in lax terminal racemes, raceme longer than vegetative stem. Calyx 10-ribbed, 7–9 mm long; tube 5–7 mm long; lobes 5, equal, or 6 to 8 unequal, narrowly lanceolate, < ½ tube length. Corolla red with yellow throat, occasionally yellow, tube 11–14 mm long, bent and expanded distally above calyx, sparsely to densely pubescent; lobes of lower lip 3–5 × 2–3 mm, obovate, spreading, upper lip 3 × 3–4(–7) mm, emarginate, wider than long.

The red-flowered witchweed, which severely damages sorghum [*Sorghum bicolor* (L.) Moench.], maize (*Zea mays* L.), and other crops, is *S. asiatica*.

Hepper (1974) retained the name *S. asiatica* for the well-branched plant with dark-colored flowers over *S. lutea*, the name used for many years for the species of agronomic importance (e.g., in the United States, Sand et al., 1990). *Striga lutea* (see discussion below) and *S. hirsuta* may also have red corollas.

Striga lutea and *S. hirsuta* can also attack crops, but with no discernible damage. Because of confusion among these plants, reports in the literature of a red-flowered witchweed damaging a crop need to be verified.

Some workers, e.g., Musselman and Hepper (1986), *have* lumped *S. asiatica*, *S. lutea*, and *S. hirsuta* as a single species, *S. asiatica*. However, Mohamed (1994) reported consistent morphological, ecological, and phenological differences among these and concluded that three taxa should indeed be recognized.

The geographical range of *S. asiatica* includes southern and central Africa, where it is common on light sandy soils. It has also been collected from Abu Zaabal, Nile Delta, Egypt (Fig. 4), no doubt through contaminated grain seed, which is a major source of dispersal (Berner et al., 1992). In Madagascar and southern Africa, especially Botswana, *S. asiatica* does most damage to crops like sor-

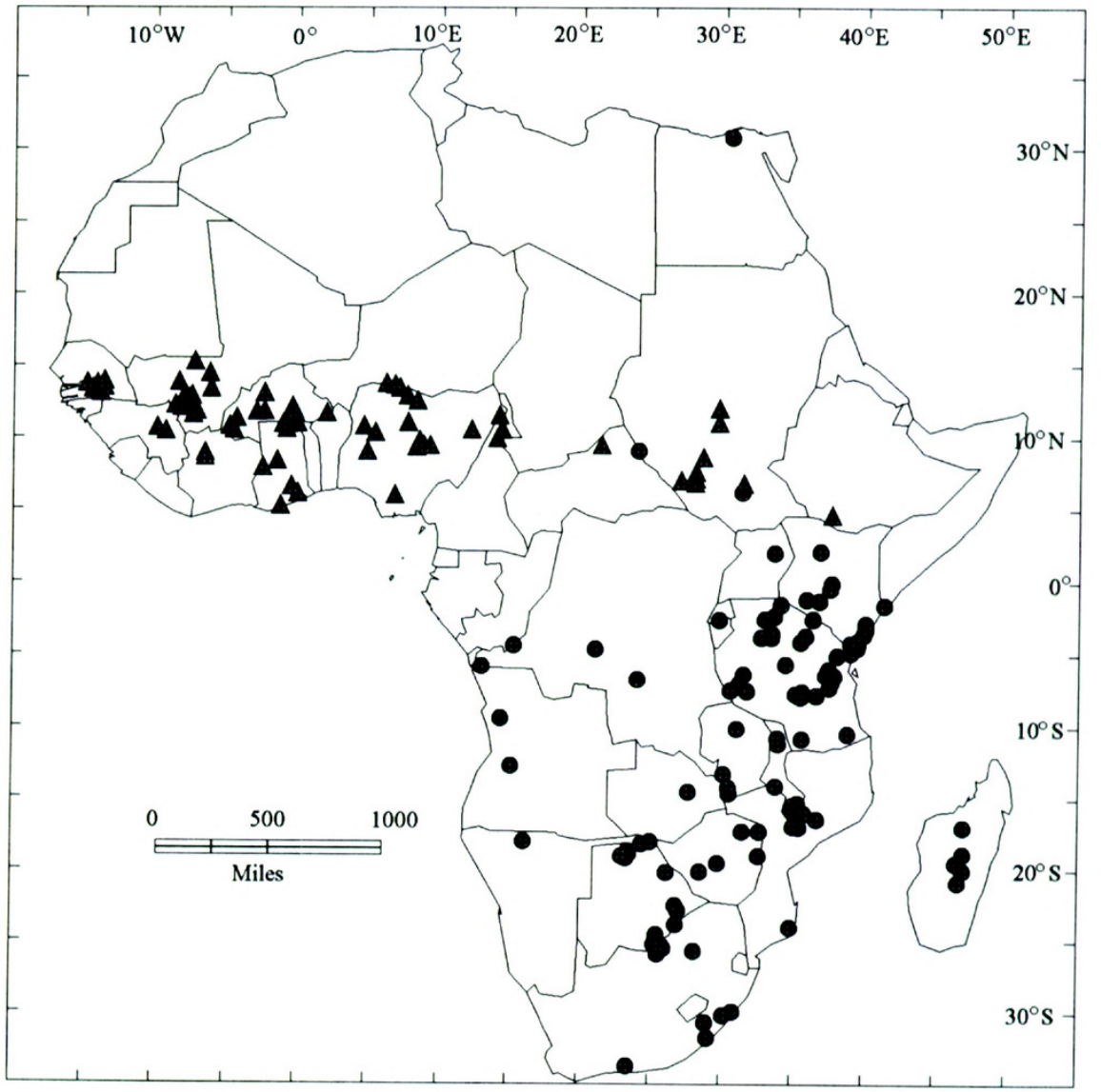

Figure 4. Distribution based on specimens of *Striga asiatica* (circle) and *S. aspera* (triangle).

ghum, maize, and millet [*Pennisetum americanum* (L.) Schumann] (Ralston et al., 1987).

Striga asiatica is not recorded as a pest in Africa outside this region except in Kenya (Musselman, unpublished) and its introduction in the Republic of Togo (Agbobli, 1991). Recently, rice in Madagascar has been attacked by *S. asiatica* (Geiger et al., 1996).

The center of origin of *S. asiatica* is most likely African (Raynal-Roques, 1991); it probably evolved in southern Africa, Madagascar, or the Mascarenes. This assumption is supported by the presence of the very similar and putatively related (Mohamed, 1994) *S. elegans* Benth. only in southern and eastern Africa. If correct, then the *S. asiatica* population introduced to the Carolinas in the United States came from southern Africa. Allozyme studies indicate that the introduction occurred once from an autogamous population (Werth et al., 1984).

Selected specimens examined. ANGOLA. **Cuanza North:** Cassoalala, 9°25′S, 14°20′E, *Anonymous 8347* (K). **Huambo:** 12°44′S, 15°5′E, *Wellman 1769* (K). **Loanda:** Zenzado, 8°48′S, 13°14′E, *Gossweller 4466* (K). BOTSWANA. Central Mahalatswe Lands 200 km N of Gabarone, *Musselman 7003* (ODU). **Central:** Swooning, near Serowe, 22°28′S, 26°47′E, *Mitchison 1975* (K). **Chobe:** Formabachena, near Pandamatenga, 18°9′S, 24°24′E, *Musselman et al.* 9/4/86 (ODU). **Ngamiland:** Okavango, Moremi Wildlife, 19°10′S, 23°16′E, *Smith 845* (K). **Southern:** Lobatsi, Magabane, 25°12′S, 25°38′E, *De Bell 878* (K). BURUNDI. **Eastern:** Astrida (Rubona Ineac), 2°33′S, 29°45′E, *Michel 5367* (K). CONGO. **Kinshasa:** Kinshasa (Leopoldville), 4°20′S, 15°15′E, *Baldwin s.n.* (K). DEMOCRATIC REPUBLIC OF CONGO. **Bas-Zaire:** Boma, 5°48′S, 13°0′E, *Soyaux 189* (K). **Kasai Oriental:** Gandajika, 6°45′S, 23°57′E, *Sieber 2401* (GH). EGYPT. **Delta:** Abu Zaabal, 30°15′N, 31°21′E, *Elhadi & Khattab 90/188* (S). KENYA. **Coast:** Kilifi, 3°35′S, 39°55′E, *Moggridge 548* (K). **Eastern:** Jakake Forest, *Jeffery K242* (K). **Nairobi:** Nairobi, 1°17′S, 36°48′E, *Napier 51* (K). **North Eastern:** Chom Airship, 18 mi. NW Kiunga, 1°35′S, 41°22′E, *Gillespie 186* (K). **Rift Valley:** Isiolo to Mathews

Range, 0°24′N, 37°33′E, and Mountain Nyiru, 2°10′N, 36°50′E, *Nesbould 1958* (K). LESOTHO. **Western:** Mafetieng, 29°50′S, 27°10′E, *F.B. 6431* (K). MADAGASCAR. **Southern:** Katoala, S of Ambovombe, 25°8′S, 46°5′E, *Decary 9014* (US). MALAWI. **Central:** Bunda Agriculture College Farm, 23 km S of Lilongwe, 14°8′S, 33°47′E, *Brummit 8661* (K). **Northern:** Rumpi, 1 mi. up Shelinda River, 10°55′S, 33°53′E, *Pawek 12566* (K). **Southern:** Lower Shire Valley, 15°45′S, 35°0′E, *Lawrence 15* (K). MOZAMBIQUE. **Cabo Delgado:** 15 km on Mocimboa–Mueda Road, 10°40′S, 40°35′E, *Jasen 8158* (K). **Gaza:** 3 km from Chibuto, 24°39′S, 33°30′E, *De Lemes & Balsinhas 92* (K). **Inhambane:** Govuro, 7 km from Banamana, 24°2′S, 34°54′E, *Correia & Marques 4142* (K). **Manica:** Odzi River Valley, 18°59′S, 32°37′E, *Jeagu 84* (K). **Maputo**: Namaacha, 25°59′S, 32°05′E, *Sousa 555* (K). **Niassa:** E Coast of Lake Nyasa, *Johnson 101* (K). **Zambezia:** Lugela, Hamagru, 16°25′S, 36°43′E, *Faulkner 90* (K). NAMIBIA. **Owambo:** Olukonda 18°0′S, 16°3′E, *Reed 3/1888* (K). SOUTH AFRICA. **Natal:** Durban North, Prospect, 29°55′S, 30°56′E, *Forbes 1/1929* (K). **Nxikazi:** Kangwane Homeland, *Musselman 7022* (ODU). **Orange Free State:** Kroonstad, 27°46′S, 27°12′E, *Rogers 96* (US). **Transki:** Grigualand East, Clydis-dall, 30°40′S, 29°0′E, *Tyson 1222* (GH). **Transvaal:** near Pretoria, 25°40′S, 28°10′E, *Gkvile 41* (K). SUDAN. **Al-jazirah:** Gir, *Anonymous 2159* (K). **Bahr Al-Gabal:** Addai, 9°50′N, 24°0′E, *Anonymous 2180* (K). **Northern:** Ghattas, *Schweinfurth 2285* (K). **Jungali:** Bor, Zandi Land, Li Atafu, 6°12′N, 31°20′E, *Wyld 225* (K). TANZANIA. **Arusha:** Endabash, Lake Manyara National Park, 3°40′S, 35°50′E, *Greenway & Polhill 11305* (K). **Dar es Salaam:** Dar es Salaam, 6°47′S, 39°18′E, *Kuntze* 7/iv94 (US). **Iringa:** Ruaha National Park, at road to Idodi, 7°40′S, 35°25′E, *Bjronstad 1294* (K). **Lindi:** Nachingwea, 10°28′S, 38°49′E, *Anderson 846* (K). **Mafia Island:** Kikuni, *Greenway 5097* (K). **Mara:** Kampi Ya Mawe, 25 mi. from Scronera Musoma, 1°30′S, 34°6′E, *Greenway 10519* (K). **Morogoro:** Nguru Mountains, 6°3′S, 37°26′E, *Thulin & Mhoro 3140* (K). **Mwanza:** Nyahanga, 2°20′S, 33°3′E, *Tanner 810* (K). **Pwani:** 23 km SE of Bagamoyo, 6°34′S, 39°1′E, *Thulin & Mhroro 488* (K). **Rukwa:** Tumba, 7°30′S, 31°45′E, *Bullock 3770* (K). **Ruvuma:** Tunduru, 60 mi. from Masasi, 11°7′S, 37°2′E, *Richards 17980* (K). **Shinyanga:** Shinyanga, 3°30′S, 33°30′E, *Choner 2005* (K). **Singinda:** Manyoni, S of Itigi Station, 5°37′S, 34°27′E, *Greenway & Polhill 11736* (K). **Tanga:** Dahali-Madanga, 4°45′S, 39°′E, *Tanner 3018* (K). **Zanzibar:** Chaani, and Pemba, *Greenway 1204* (K). UGANDA. **Eastern:** Amuria, 2°4′N, 33°37′E, *Williams 32* (K). ZAMBIA. **Central:** near Kapushi River, Lukanga Plains, 14°30′S, 27°40′E, *Troprell 2050* (K). **Eastern:** Luangwa Valley, Tunwe Munkanya, 14°2′S, 30°30′E, *Phiri 79* (K). **Northern:** Chisnoima Falls, Luombi River, 10°6′S, 31°0′E, *Richards 5230* (K). ZIMBABWE. **Mashonaland North:** Midlands, near Makava, 17°17′S, 32°42′E, *Musselman 4/17/86* (ODU). **Matabeleland North:** Bulawayo, Waterford, 20°7′S, 28°32′E, *Norrgrann 459* (K). **Midlands:** Gwelo, Msasa-Mnondo, Senka Area, 19°0′S, 29°46′E, *Biegel 1912* (K).

5. Striga aspera (Willd.) Benth., Companion Bot. Mag. 1: 362. 1835. *Euphrasia aspera* Willd., Syst. 2: 776. 1801. TYPE: Ghana. *Isert s.n.* (holotype, BM!; isotype, C not seen).

Striga aspera var. *schweinfurthii* Skan, Fl. Trop. Afr. 4(2): 403. 1906. TYPE: Sudan. *Schweinfurth 1992* (holotype, K!).

Striga aspera var. *filiformis* Benth., in DC. Prodr. 10: 501. 1846. TYPE: Niger. *Vogel 15* (holotype, K!).

Annual, to 53 cm tall, slender, unbranched or branched from the middle, densely hispid, stem obtusely square. Leaves (10–)20–35(–60) × 1(–2) mm, opposite, linear, ascending or spreading, longer than internodes, margin entire, veins obscure. Lower bracts 8–30(–40) mm, leaf-like, longer than calyx, upper bracts lanceolate, shorter than calyx. Flowers alternate in open racemes, raceme shorter than vegetative stem. Calyx 5-ribbed, 5–10 mm long; tube 4–6 mm long; lobes 5, almost equal, linear, 3–5 mm long, as long as tube. Corolla weakly bilabiate, pinkish purple (rarely white), tube 12–16 mm long, bent and expanded distally above calyx, sparsely glandular-pubescent; lobes of lower lip 4–8 × 2–5 mm, obovate, upper lip 3–7 × 4–7 mm, emarginate or subtruncate, as long as wide.

Superficially, *Striga hermonthica* and *S. aspera* resemble one another. There are three characters to distinguish between them: corolla tube bend, pubescence, and size of calyx lobes. In the field, *S. aspera* can be differentiated from *S. hermonthica* by its slender stem and the pinkish purple corolla tube bent distally above the calyx teeth. The tube of *S. hermonthica*, on the other hand, bends in the middle, that is, proximally within the calyx teeth. Unfortunately, there are plants with intermediate characters. *Striga aspera* is sparsely glandular-pubescent, while *S. hermonthica* lacks a glandular-pubescent corolla tube. The glandular pubescence of the corolla and the short calyx lobes are the most consistent characters separating these two species. Calyx lobes in *S. aspera* are almost equal to the tube length with the adaxial lobe more than 1 mm long, whereas the lobes of *S. hermonthica* are short, triangular. The adaxial lobe is less than 1 mm long in *S. hermonthica.*

Leaves of *S. hermonthica* are more than 2 mm wide, whereas leaves of *S. aspera* are rarely 2 mm wide. This and the smaller stems make the overall aspect of *S. aspera* more delicate.

Striga aspera and *S. hermonthica* interbreed; both are outbreeders. Aigbokhan et al. (1998, 2000) demonstrated a high rate of interfertility between the two species. Morphological differences between the two species, compared to within-species variation, and the low germination percentage of their hybrids' seeds (Aigbokhan et al., 1998), support the current taxonomic treatment of recognizing two species. Chromosome numbers are also

different, with *S. aspera* N = 18 and *S. hermonthica* N = 19 (Aigbokhan et al., 1998).

Striga aspera, in its more delicate forms, may resemble *S. brachycalyx* Skan and *S. passargei*, and the three species are sympatric in most of their range.

Striga aspera is in the Sahelian and Sudanian domains of Africa (Fig. 4), from Senegal to Sudan between 4°43′N and 15°18′N (Fig. 4). Together with *S. gesnerioides* and *S. hermonthica* it has the most northern distribution of all species. Unlike *S. hermonthica*, however, the range of *S. aspera* does not extend south of the equator. *Striga aspera* has been reported to attack maize but not sorghum in Ethiopia (Parker, 1988) and fonio [*Digitaria exilis* (Kippist) Stapf], maize, rice (*Oryza sativa* L. and other species), and sugarcane in West Africa (Parker & Riches, 1993). The extension of agriculture into natural grasslands may expose crops to this species, especially in West Africa where it is common.

Kenfack et al. (1996) have shown that *S. aspera* in northern Cameroon has the broadest host range (Poaceae and Cyperaceae, 18 genera, 24 species) of the eight species of witchweeds they studied.

Selected specimens examined. BURKINA FASO. **Center East:** 5 km N of Tenkodogo, 11°50′N, 0°19′W, *Safa & Musselman* 10/25/87 (ODU). **Eastern:** Fada N'Gourma, 12°12′N, 0°25′E, *Raynal 22127* (K). **Haut Bassins:** Banfora, 10°50′N, 4°50′W, *Raynal 22394, 22395* (K). **Northern:** 5 km E of Godi, 11°55′N, 2°24′E, *Safa & Musselman* 10/12/87 (ODU). **Volta:** Boromo, 11°50′N, 2°55′W, *Raynal 22309* (K). CAMEROON. **Northern:** Champs/Piedmont, Maroua, 10°35′N, 14°22′E, *Meurillon 1363* (K). CENTRAL AFRICAN REPUBLIC. **Vakaga:** Dongolo Plains, 9°33′N, 21°24′E, *Fay 2794* (K). ETHIOPIA. **Sidamo:** Upper Birr State Farm, N of Bore, 4°43′N, 37°40′E, *Parker 4065* (K). GAMBIA. **Central:** Denfi, *Terry 3173* (K). **Eastern:** Basse, 13°25′N, 14°28′W, *Terry 1942* (K). GHANA. **Eastern:** 2/3 of way between Adidame and Ho, 6°40′N, 0°30′E, *Morton s.n.* (K). **Northern:** just N of Buige Bridge on Kintampo to Tamale Road, 8°25′N, 1°30′W, *Hossain & Agyakwah 37826* (K). **Upper:** Bolgatanga, 10°40′N, 0°50′W, *Hossain & Agyakwah 37829* (K, US). GUINEA. **Eastern:** Kankan, 10°30′N, 9°20′W, *Pobeguin 1020* (K). IVORY COAST. **Central:** CIDT Office at Kouto, 45 km N of Bouandougou, 9°0′N, 6°32′W, *Riches 230, 233* (K). MALI. **Koulikoro:** 11 km N of Didieni, 13°55′N, 8°25′W, *Musselman & Mohamed* 10/6/88 (ODU). **Segou:** Famabougou, 17 km from Sokolo, 14°39′N, 6°15′W, *Raynal 22581* (K). NIGER. Boundom to Chetimari, *Saadou 1839* (K). **Dosso:** Dongondoutchi, 13°50′N, 4°8′E, *Parker 2314* (ODU). **Maradi:** Dan Issa Road, 3 mi. from Maradi, 13°30′N, 7°7′E, *Hall 452* (K). NIGERIA. **Bauchi:** Hassan Estate, Luna Road, 10°10′N, 9°20′E, *Knepper* 9/26/89 (ODU). **Kano:** 7 km S of Katsina on Kano Road (163 km N Kano), 12°57′N, 7°40′E, *Parker 2046* (K). **Plateau:** Jos Plateau, Naroguta, 9°50′N, 4°35′E, *Lawlor & Hall* n *46508* (K). **Sokoto:** 10 mi. N of Bussa, 50 mi. S of Yelwa, 10°15′N, 4°35′E, *Cook 358* (K). SENEGAL. **Oriental:** 41 km NE of Velingara, 13°26′N, 13°55′W, *Musselman 7085* (K, ODU). SUDAN. **Bahr Al-Ghazal:** on River Sue, between Peili and Wau, 7°10′N, 28°0′E, *Meyers 7329* (GH, K). **Jungali:** 12 km E of Nyany, 80 km N of Bor, 6°52′N, 31°25′E, *Lock 81/132* (K). **South Kurdufan:** Dilling, Nuba Mountains, 12°5′N, 29°41′E, *Andrews 6* (K). **Upper Nile:** Djur, Jeriba Ghaffas, 8°39′N, 28°35′E, *Schweinfurth 1992* (S).

6. Striga bilabiata (Thunb.) Kuntze, Rev. Gen. Pl. 3(2): 240. 1898. *Buchnera bilabiata* Thunb., Prodr. Pl. Cap 100. 1800. TYPE: South Africa. *Thunberg s.n.* (holotype, UPS!).

Perennial, 20–60 cm tall, stiffly erect, unbranched or with 2 to 3 branches from below middle, pilose or scabrous hispid. Stem either terete, square and furrowed, or winged. Leaves 2–6 × 1–2 mm, lanceolate, appressed, or 10–60 × 1–2(–5) mm, linear, ascending or spreading, shorter or longer than internodes, margin entire, veins obscure. Bracts 5–20 × 1–3 mm, linear or lanceolate, shorter or longer than calyx. Calyx tubular, 5-ribbed, 4–12 mm long; tube 2–6(–8) mm long; lobes 4 equal or 5 unequal, linear or deltate, 1–5 mm long. Corolla densely pubescent, tube 7–17 mm, bent and expanded proximally or distally; lobes of lower lip 1–4(–7) × 1–2 mm, upper lip 2–4(–7) × (1–)2–4(–7) mm, the three lobes of the lower lip and the two lobes of the upper lip are fused almost their entire length forming a strongly bilabiate corolla, tips obtuse or acute, short.

The lack of dependable characters separating *S. bilabiata*, *S. rowlandii* Engl., *S. barteri* Engl., *S. ledermannii* Pilger, and *S. welwitschii* Engl. led Hepper (1960) to reduce these species to subspecies of *S. bilabiata*. Statistical analysis of populations of each subspecies of *S. bilabiata* supported Hepper's treatment (Mohamed, 1994). All subspecies of *S. bilabiata* form a natural group with characters grading into one another. Like *S. bilabiata*, *S. linearifolia* also possesses a strongly bilabiate corolla, winged stem, perennial habit, and occurs in small populations. We consider *S. linearifolia* as a sixth subspecies of *S. bilabiata*; otherwise, we follow Hepper (1960).

The following is a key, followed by brief descriptions, of the subspecies of *S. bilabiata*:

KEY TO SUBSPECIES OF *S. BILABIATA*

1. Bract broader than leaf; lower corolla lobes obtuse 2
1′. Bract narrower than leaf, lower corolla lobes acute 3
2(1). Calyx lobes subulate, about same length as tube, flowers opposite in spikes, spike as long as vegetative stem ..... 6b. subsp. *bilabiata*
2′. Calyx lobes lanceolate, < ½ tube length, flow-

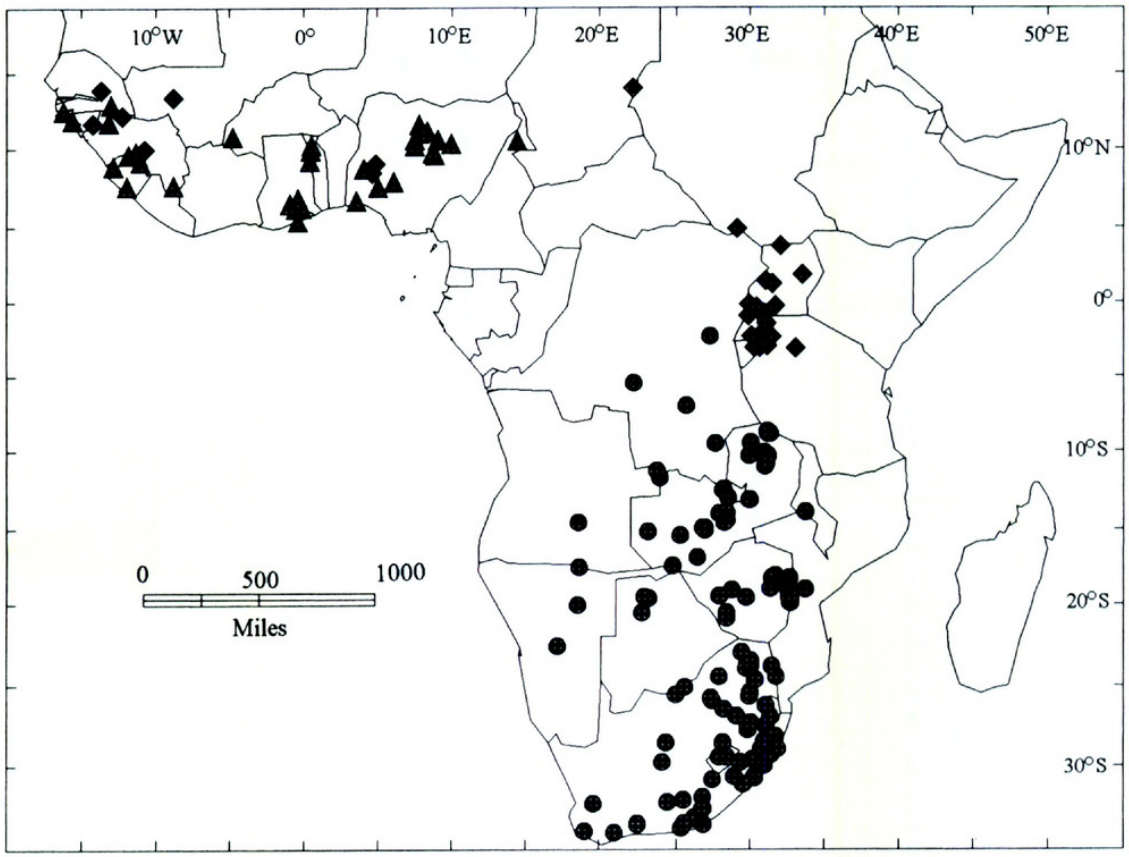

Figure 5. Distribution based on specimens of *Striga bilabiata* subsp. *barteri* (diamond), *S. bilabiata* subsp. *bilabiata* (circle), and *S. bilabiata* subsp. *rowlandii* (triangle).

ers imbricate in strobilus-like spikes, spike much shorter than vegetative stem ..... 6c. subsp. *jaegeri*

3(1). Leaf scale-like, < 1 cm long, plant covered with appressed, hispid hairs; corolla bent proximally within calyx teeth .... 6e. subsp. *linearifolia*

3′. Leaf not scale-like, 3–8 mm long; plant covered with soft or hispid divergent hairs; corolla bent distally above calyx 4

4(3). Plant ciliate; inflorescence strobilus-like; calyx 5 mm long ..... 6d. subsp. *ledermannii*

4′. Plant pilose; inflorescence not strobilus-like; calyx 6–12 mm long. 5

5(4). Stem winged; calyx lobes deltate, ½ tube length; spike shorter than vegetative stem ..... 6f. subsp. *rowlandii*

5′. Stem terete; calyx lobes linear, equaling tube length; spike longer than vegetative stem ..... 6a. subsp. *barteri*

6a. Striga bilabiata subsp. **barteri** (Engl.). Hepper, Kew Bull. 14: 414. 1960. *Striga barteri* Engl., Bot. Jahrb. Syst. 23: 514. 1897. TYPE: Nigeria. Nupe, *Barter 1170* (holotype, K!).

Striga glandulifera Engl., Bot. Jahrb. Syst. 23: 514, fig. H–J. 1897. TYPE: Sudan. *Schweinfurth 2931* (isotype, K!).

Plant to 18 cm tall, usually unbranched, densely pilose with divergent hairs, stem terete. Leaves 10–40 × 1–3 mm, linear, spreading, tortuous when dry, longer than internodes. Lower bracts 10–22(–45) × 1 mm, linear, longer than calyx, upper bracts lanceolate, shorter than calyx. Flowers alternate, the upper ones opposite, forming long open spikes, spike longer than vegetative stem. Calyx 6–12 mm long; tube 4(–8) mm long; lobes 5, unequal, linear, 3–4 mm long, about the same length as tube. Corolla lilac or pinkish, 12–14 mm long, bent and expanded distally above calyx, tube pubescent or glandular-pubescent; lobes of lower lip 2–3 × 1 mm, tips acute, upper lip 2–4 × 2 mm, tips acute.

The range of *S. bilabiata* subsp. *barteri* extends from Senegal to southern Sudan and south into Uganda and Tanzania between 14°N and 3°10′S (Fig. 5). Within this region, it occurs only in small scattered populations among grasses in rocky savanna woodland.

Selected specimens examined. BURUNDI. **Ruyigi:** Kigamba, 3°6′S, 30°33′E, *Reekmans 7125, 7166* (K). CHAD. **Logone-Oriental:** Doba, 8°39′N, 16°51′E, *Elliott s.n.* (K). GUINEA. **Northwest:** Kouroussa, Banko, 10°45′N, 9°54′W, *Adam 26896* (MO). GUINEA BISSAU. **Southern:** Madina do Boe, 11°45′N, 14°13′W, *Epirito Santo 3199* (K); Kipkarren, *Hill 755* (K). MALI. **Kayes:** Madina, 13°25′N, 8°48′W, *Robert 16608* (K). NIGER. *Barter 1170* (GH). NIGERIA. **Kwara:** slope near waterfall at head of Jebba Glen, 9°5′N, 4°50′E, *Meckle 1011* (K). RWANDA. **Southern:** Mutara, Ngarama, 2°20′S,

30°10′E, *Alcool 4116* (K). SENEGAL. **Oriental:** Tambacounda, Hasirik, 13°45′N, 13°40′W, *Adam 17917, 17934* (MO), *Tutin 162* (K). SUDAN. **Equatoria:** Zandi-land, Ibba, 4°50′N, 29°10′E, *Wyld 725* (BM). TANZANIA. **Mwanza:** Nyanhanga, Bugufi, Ngara, 3°10′S, 33°8′E, *Tanner S110* (K). **Ziwa Magharibi:** Bukoba, near Nddma, 1°30′S, 31°10′E, *Harrer 2227* (K); W Lake Province, Lusahanga, Biharamulo, 2°52′S, 31°12′E, *Tanner 5655* (K); W lake Prov., Murukurazo, Bugufi, Ngara, 2°25′S, 30°35′E, *Tanner 5108* (K). UGANDA **Eastern:** Sorati, Kapiri Ferry, 1°43′N, 33°35′E, *Lind 340* (K). **North Buganda:** Butemba-Singo, 1°8′N, 31°35′E, *Brown 2027* (K); Kambuga, Kizezi, 1°0′S, 29°58′E, *Purseglove 2711* (K). **Northern:** 2 km SE of Kikandwa, 3°38′N, 32°7′E, *Lester & Morrison 2337* (K). **South Buganda:** Masaka, 0°21′S, 31°45′E, *Elliott 1481* (K); Mubende, Lukwamnigo Hills, 1°0′N, 31°0′E, *Lanbrester 18* (K). **Western:** Mubende, 1°5′N, 31°5′E, *Lind 2027* (K), *Plant 706* (K); Toro, Oruha Hill, 0°25′N, 30°30′E, *Eggeling 4033* (K).

6b. **Striga bilabiata** Kuntze subsp. **bilabiata**

Striga thunbergii Benth., Companion Bot. Mag. 1: 363. 1835. TYPE: Botswana. *(?)Anonymous 2494* (holotype, K!).

Striga thunbergii var. *grandiflora* Benth., in DC. Prodr. 10: 502. 1846. TYPE: South Africa. Kat River Poort, *Drége 2297b* (holotype, K!).

Striga welwitschii Engl., Bot. Jahrb. Syst. 23: 514, 12, fig. F, G. 1897. TYPE: Angola. *Welwitsch 5821/5820* (holotype, K!; isotype, BM!).

Striga thunbergii var. *grandiflora* Engl., in Baum Kunene-Samb. Exped. 369. 1903. TYPE: Angola. Longamindung, *Baum 552* (holotype, K!).

Plant 20(–40) cm tall, usually unbranched or with 2 or 3 branches from base, scabrous, densely hispid with divergent hairs, stem square, furrowed. Leaves 10–20(–30) × 1(–2) mm, linear or lanceolate, ascending, decussate, longer than internodes. All bracts similar, 6–18 × 1–3 mm, lanceolate, ciliate, enclosing calyx, broader than leaves. Flowers opposite in short, dense spikes, spike as long as vegetative stem. Calyx 6–10 mm long; tube 3–5(–7) mm long; lobes 5, unequal, subulate, 3–5 mm long, about the same length as tube. Corolla white or mauve, tube 10–15 mm long, bent and expanded proximally within calyx teeth, densely glandular-pubescent; lobes of lower lip 2–4 × 1–2 mm, tips obtuse, upper lip 2–5(–7) × 2–4 mm, tips obtuse.

Striga bilabiata subsp. *bilabiata* is found only between 2°22′S and 34°02′S (Fig. 5) in southern Democratic Republic of Congo, Zambia, Angola, Zimbabwe, Botswana, and South Africa. It is less frequent to the north and unknown from the East African coast. This subspecies varies considerably in height but is typically about 20 cm tall. *Striga bilabiata* subsp. *bilabiata* is strongly autogamous (Ralston et al., 1987).

Selected specimens examined. ANGOLA. **Banguella:** Banguella, 12°36′S, 13°20′E, *Gossweller 2234* (K). **Moxico:** 2 mi. N of Jimele River bridge on Caianda–Mwinilunga road, 11°17′S, 23°48′E, *Richards 17147* (K). BOTSWANA. 3 mi. SW Nzinzi down Omuramba Mpungu, *Winter 3995* (K). **Ngamiland:** banks of Okavango River at Runtu, 19°34′S, 23°15′E, *Winter & Marais 4478, 4913* (K). **North District:** Tsetse Fly Camp, W of Parakarungu, *Lambrecht 264* (K). **Southern:** Digkatlong Ranch, 25°40′S, 25°3′E, *Hansen 3016* (K, MO). DEMOCRATIC REPUBLIC OF CONGO. **Kivu:** 6.3 km NW of Katshungu, 2°22′S, 27°22′E, *Anonymous 4863* (K). **Shaba:** Katanga, Biano Plateau, 7°0′S, 27°22′E, *Russell 41* (K). LESOTHO. **Central:** N of Blue Mountains Pass, 29°30′S, 28°30′E, *Dieterlen 527* (K). **Northern:** Leribe, 28°58′S, 28°0′E, *Dieterlen 529* (K). MALAWI. **Central:** Lilongwe, 13°59′S, 33°47′E, *Jackson 649* (K). MOZAMBIQUE. **Maputo:** Namaacha, Mt. Ponduine, 26°0′S, 32°25′E, *Schuter & Nuvunga 6644* (K). NAMIBIA. **Windhoek:** 20 mi. SW of Windhoek, Farm Haris, 22°35′S, 17°4′E, *Winter 2540* (K). SOUTH AFRICA. **Cape:** Stockenstrom, Nogsback, 32°40′S, 26°50′E, *Leighton 2948* (MO). **Natal:** Bethlehem, Royal National Park, Tugela River, 28°45′S, 29°28′E, *Ross 2240* (K). **Orange Free State:** Barkly West, Cristaalfrontein, 28°30′S, 24°26′E, *Acocks 1481* (K). **Transkei:** Griqualand East, Clydesdall, 30°40′S, 29°0′E, *Tyson 894* (GH). **Transvaal:** Albany, Alicedale Road, 26°6′S, 28°5′E, *Bayliss 8112* (MO, US). SWAZILAND. **Hhohho:** 5 km NW of Mbabane, 26°18′S, 31°6′E, *Kemp 701* (MO, US). **Matobo:** Farm Besua Kobila, *Miller 7260* (K). ZAMBIA. **Central:** 5 mi. from Mumbwa on Road to Kafue Hoek, 15°0′S, 26°52′E, *Drummond & Cookson 6185* (K). **Copperbelt:** 3 km NE of Mufulira, 12°30′S, 28°17′E, *Cruse 372* (K). **Lusaka:** Broken Hill, 14°30′S, 28°29′E, *Mutimushi 932* (K). **Mbala:** Lyopa Plain, *Sanane 980* (K). **Northern:** 16 km N of Mbala, 8°40′S, 31°15′E, *Philcox et al. 10170* (K). **Western:** 4 mi. N of Kalobo, 14°55′S, 22°30′E, *Drummond & Cookson 6451* (K). ZIMBABWE. Farm Besna Kobila, *Miller 2630, 2671, 5737* (K). **Lomagundi:** Great Dyke, *Philcox & Muller 9080* (K). **Manicaland**: Inyanga, Cheshire, 18°15′S, 32°42′E, *Norlindh & Weimarck 44347* (K). **Mashonaland South:** Macheke, 18°6′S, 31°47′E, *Eyles 2015* (K). **Matabeleland South:** Matopo, 20°28′S, 28°29′E, *Miller 1590* (MO).

6c. **Striga bilabiata** subsp. **jaegeri** Hepper, Kew Bull. 14: 415. 1960. TYPE: Mali. Massif de Kita, *Jaeger k.2 (753/51)* (holotype, K!).

Striga brouilletii Mielcarek, Bull. Jard. Bot. Belg. Bull. Nat. Plantentuin Belg. 58: 121–127. 1988. TYPE: Guinea (Conakry). Mt. Kankan: Koumbankourou, *Lisowski 80579* (holotype, POZG, photo!; isotype, BR not seen).

Plant 30–40 cm tall, unbranched, densely hispid with divergent hairs, stem winged. Leaves 40–70 × 2–3 mm, linear to narrowly elliptic, spreading, decussate, alternate toward the apex, with prominent midrib, longer than internodes. All bracts similar, 9–11 × 3–4 mm, widely obovate, acuminate, ciliate, enclosing calyx, broader than leaves. Flowers imbricate in short, dense, strobilus-like spikes, spike much shorter than vegetative stem. Calyx 7–8 mm long; tube 5–6 mm long, lobes 4 equal, or 5

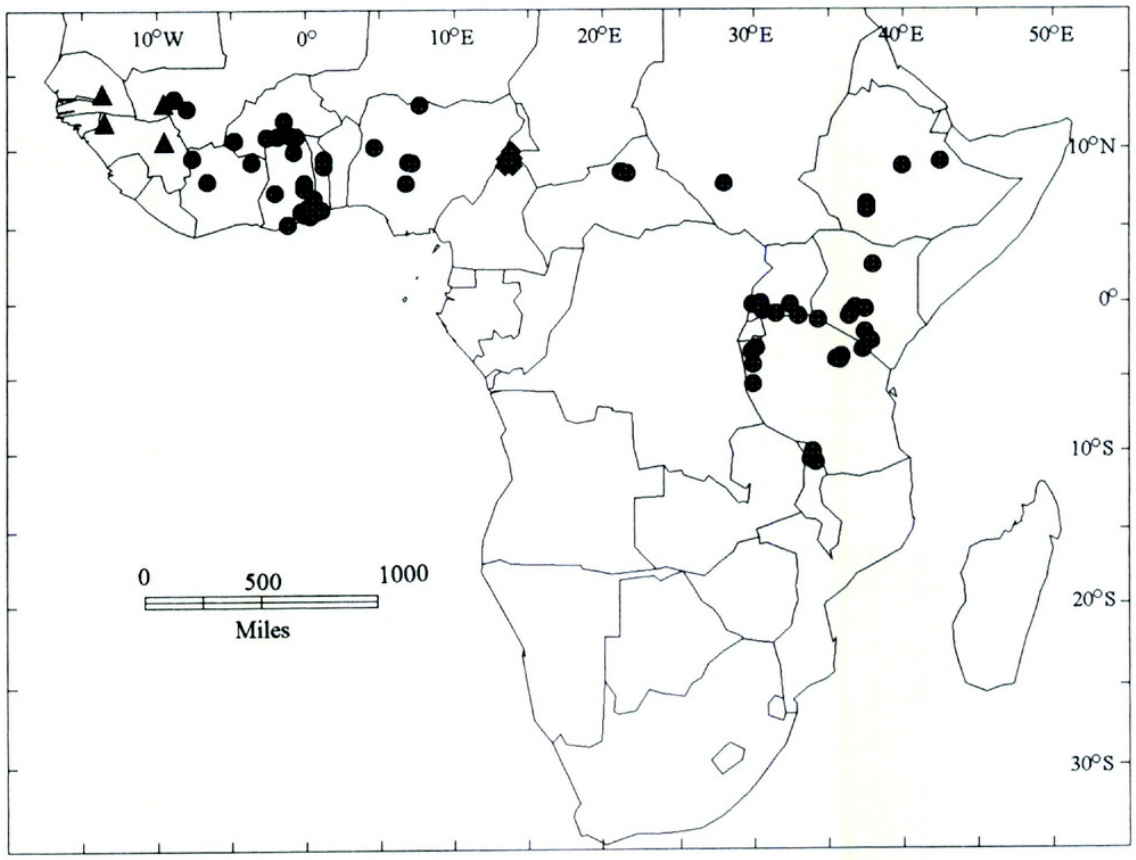

Figure 6. Distribution based on specimens of *Striga bilabiata* subsp. *jaegeri* (triangle), *S. bilabiata* subsp. *ledermannii* (diamond), and *S. bilabiata* subsp. *linearifolia* (circle).

unequal, lanceolate, 1–2 mm long, < ½ tube length. Corolla mauve, tube 15–17 mm long, bent and expanded distally above calyx, densely pubescent; lobes of lower lip 2–4 × 2 mm, tips obtuse, upper lip 1.5–2.5 × 1–2 mm, tips obtuse.

Striga bilabiata subsp. *jaegeri* is a rare taxon determined by its broad bracts and short compact spikes. It has been collected from savanna on rocky plateaus in Guinea, Senegal, and Mali between 10°18′N and 13°50′N (Fig. 6). *Striga bilabiata* subsp. *barteri* and *S. bilabiata* subsp. *jaegeri* have more northerly distributions than *S. bilabiata* subsp. *linearifolia* and *S. bilabiata* subsp. *rowlandii* (Figs. 5, 6).

Selected specimens examined. GUINEA. **Northern:** 5 km NW of Karifameriya, 11°55′N, 13°30′W, *Lisowski 80551* (BR). MALI. **Kayes:** Kita, 13°10′N, 9°34′N, *Jaeger 753/51, 2541* (K). SENEGAL. **Oriental:** Tambacounda, Gouloumbou, 14°0′N, 13°40′W, *Adam 14861* (MO).

6d. Striga bilabiata subsp. **ledermannii** (Pilger) Hepper, Kew Bull. 14: 413. 1960. *Striga ledermannii* Pilger, Bot. Jahrb. 45: 215. 1910. TYPE: Cameroon. Garoua, *Ledermann 4529* (lectotype, designated by Hepper (1960), BM!).

Plant 36 cm tall, unbranched, scabrous, with ciliate divergent hairs, stem winged. Leaves 10–23 × 2–3(–5) mm, lanceolate, decussate, decurrent, appressed, enclosing stem, longer than internodes. All bracts similar, 5–15 × 2–4 mm, imbricate, elliptic or lanceolate, ciliate, enclosing calyx. Flowers imbricate in short, dense, strobilus-like spikes, spike shorter than vegetative stem. Calyx 5 mm long; tube 2.5–3 mm long, lobes 5, unequal, linear, 2–3 mm long, about the same length as tube. Corolla pink, tube 12 mm long, bent and expanded distally above calyx, usually retrorsely pubescent; lobes of lower lip 1–2 × 0.5–1 mm, short, tips acute or obtuse, upper lip 3 × 1–2 mm, tips obtuse.

Striga bilabiata subsp. *ledermannii* is endemic to the northern province of Cameroon between 9°N and 10°N (Fig. 6). It is infrequent, like other subspecies of *S. bilabiata*, perhaps because it only parasitizes perennial hosts such as *Loudetia simplex* (Nees) C. E. Hubbard, *Schizachyrium sanguineum* (Retz.) Alston, and *Hyparrhenia* species (Kenfack et al., 1996). Although the hosts of other subspecies of *S. bilabiata* have not been studied, parasitism of perennial hosts may explain why *S. bilabiata* subsp. *barteri*, *S. bilabiata* subsp. *linearifolia*, and *S. bil-*

abiata subsp. *jaegeri* are infrequent and occur only in small populations.

Selected specimens examined. CAMEROON. **Northern:** 20 km SW of Dourbey, Biatonmi, *Fotius 2219* (K); 23 km S Garoua, 9°0′N, 13°25′E, *Musselman et al.* 10/16/88 (K, ODU); Bogalo by River Benue, 9°0′N, 13°50′E, *Talbot 313* (BM); Buar to Buala 9°34′N, 13°46′E, *Michael 9531* (K); Garoa, 9°16′N, 13°25′E, *Ledermann 4529* (BM); Jaiya Buge, 6°20′N, 16°15′E, *Michael 9706* (K); Kounden, 6°7′N, 14°38′E, *Saxer 254* (K); near Koubout, 9°57′N, 13°45′E, *Thomas 2452* (MO).

6e. Striga bilabiata subsp. **linearifolia** (Schum. & Thonn.) Mohamed, comb. nov. Basionym: *Buchnera linearifolia* Schum. & Thonn., Beskr. Guin. Pl.: 279. 1827. *Striga linearifolia* (Schum. & Thonn.) Hepper, Kew Bull. 14: 416. 1960. TYPE: Ghana. *Thonning 284* (holotype, C, holotype negative # 2785, 2786; isotypes, K!, P-JU not seen).

Striga strictissima Skan, Fl. Trop. Afr. 4(2): 407. 1906. TYPE: Nigeria. *Barter 1263* (holotype, K!).

Plant up to 62 cm tall, unbranched or with 1 to 2 branches from base, covered with dense, white, appressed, hispid hairs, stem winged. Leaves reduced, 3–8 × 1–2 mm, lanceolate, decussate, decurrent, appressed, shorter than internodes. All bracts similar, 5–7(–10) × 1–2 mm, lanceolate, slightly longer than calyx. Flowers opposite in dense spikes, spike shorter than vegetative stem. Calyx 4–7 mm long; tube 2–3(–4) mm long; lobes 5, unequal, linear, 1.5–3 mm long, about the same length as tube. Corolla whitish to bluish purple, tube 7–14 mm long, bent and expanded proximally within calyx teeth, densely retrorsely pubescent; lobes of lower lip 1–3(–7) × 0.5–1 mm, tips acute, upper lip 2–5 × 2–4 mm, slightly round.

Striga bilabiata subsp. *linearifolia* is widely distributed in Africa in wet grassy savannas. Its range extends from 13°N and reaches its southern limit in Malawi (10°55′S) (Fig. 6). Like other subspecies of *S. bilabiata*, it occurs in small populations often of only a few plants. For example, we gathered it once from populations of two plants in Mali, Ivory Coast, and Guinea (Conakry).

Selected specimens examined. ANGOLA. **Benguela:** Benguela, Sambo, 12°30′S, 13°26′E, *Teixerira 303* (BM). BURKINA FASO. **Central:** S of Sapones, 12°0′N, 1°30′W, *Safa & Musselman* 10/21/87 (ODU). **Haut Bassins:** 5 km S of Banfora, 10°40′N, 5°50′W, *Safa & Musselman* 10/3/87 (ODU). BURUNDI. **Central:** Gitega, 3°20′S, 29°55′E, *Anonymous 1829* (K). **Southern:** Danga (Mosso), Bururi, 4°12′S, 30°0′E, *Reekmans 6786* (K). CENTRAL AFRICAN REPUBLIC. **Bangoran:** 4 km N of Camp Koumbala, Gaumba Creek, 8°31′N, 21°13′E, *Fay 7057* (MO). ETHIOPIA. **Gamu Gofa:** Gughe highlands, 6°3′N, 37°35′E, *Gilbert & Thulin 415* (MO). **Ogaden Harerge:** Harar, Harrar-Jijega, 9°13′N, 42°29′E, *de Wilde 6399* (MO). **Shewa:** Awash National Park, 8°55′N, 39°55′E, *Gilbert & S. B. 1250* (K). GHANA. **Accra:** Accra Plains, 5°35′N, 0°6′W, *Morton 6123* (K). **Eastern:** Keta Krachi, 5°55′N, 1°2′E, *Morton 7171* (K). **Northern:** 2 mi. S Nasia on Tamale-Bolgatanga Road, 9°55′N, 0°50′W, *Adams 4152* (K). **Upper:** 10 mi. from Lambusie, 10°52′N, 2°40′W, *Morton 8794* (K). **Volta:** Akuse, 6°6′N, 0°8′E, *Vigne 4359* (US). GUINEA. *Probegum 364* (K). IVORY COAST. **Northeast:** Gawi-seye, along Iringou River, 9°14′N, 3°41′W, *Amshoff 225* (MO). **Odienne:** Odienne, 9°31′N, 7°38′W, *Adam 27125* (MO). **Seguela:** Seguela and Man, 8°0′N, 6°38′W, *Ake 8755* (K). KENYA. **Central:** Lake Naivasha, 0°48′S, 36°20′E, *Mathew 6126* (K). **Eastern:** Embu, Rumbia, 0°32′S, 37°28′E, *Graham 2405* (K). **Rift Valley:** Chyulu Hills, 2°40′S, 37°52′E, *Gilbert & Kariuki 18863* (K). **Shiyanga:** Kahawa, Kenyatta College, 3°50′S, 32°36′E, *Akestrid 2527* (UPS). MALAWI. **Northern:** 27 mi. N of Rumpi, 10°55′S, 33°54′E, *Pawek 12317* (K, MO). MALI. **Koulikoro:** Simidij, 11°40′N, 7°35′W, *Musselman & Mohamed* 9/30/88 (ODU). NIGER. *Barter 1263* (GH). NIGERIA. **Kaduna:** Katsina, Maska, 13°0′N, 7°35′E, *Keay 25896* (K). **Niger:** between Gawu–Abuja Road Junction, 9°15′N, 6°50′E, *Onochie 18697* (K). **Northern:** Lemme, *Lely 146* (K). **Plateau:** Shere Mountains, 9°10′N, 9°50′E, *Hall & Daramola 67404* (MO). **Sokoto:** 10 km N of Bussa, 50 km S of Yelwa, 10°15′N, 4°35′E, *Cook 445* (K). SUDAN. **Bahr Al-Ghazal:** Wau, 7°46′N, 28°2′E, *Anonymous 1651* (K). TANZANIA. **Arusha:** 3 mi. E of Lake Manyara, 3°40′S, 35°53′E, *Lamprey 515* (K). **Kigoma:** Buha, 56 mi. from Kasulu on Kigoma Road, 5°30′S, 30°0′E, *Verdcourt 3330* (K). **Kilimanjaro:** E Kilimanjaro, Mran Rombo, 3°12′S, 37°20′E, *Haarer 517* (K). TOGO. **Central:** 9 km N of Sokode, 9°7′N, 1°10′E, *Hakki et al. 289* (K). UGANDA. **Bokora:** Iriri, *Nilson 332* (K). **Central:** E of Mengo, Kakonge, 0°15′N, 32°28′E, *Rwaburindore 580* (MO). **Eastern:** Busana, Bugisu, 1°15′N, 34°20′E, *Eggeling 350* (K). **South Buganda:** near Sanje Rest Camp, 0°49′S, 31°30′E, *Ankole & Eggeling 610* (K). **Southern:** Ankole, Ibanda, 0°8′S, 30°30′E, *Ragslane 1251* (US). **Western:** Busoga, 8 mi. W of Kamuli, 0°58′N, 33°1′E, *Wood 726* (K).

6f. Striga bilabiata subsp. **rowlandii** (Engl.) Hepper, Kew Bull. 14: 415. 1960. *Striga rowlandii* Engl., Bot. Jahrb. Syst. 23: 513. 1897. TYPE: Nigeria. Western Lagos, *Rowland 1893* (holotype, K!).

Plant up to 34 cm tall, unbranched or with 2 or 3 branches from base, sparsely to densely pilose with divergent hairs, stem winged. Leaves 10–55 × 1–3 mm, linear, decussate, decurrent, ascending, longer than internodes. Lower bracts 7–10(–18) × 1–2 mm, lanceolate, longer than calyx, upper bracts shorter than calyx. Flowers alternate at base of inflorescence, opposite above in a somewhat dense spike, spike shorter than vegetative stem. Calyx 6–9 mm long; tube 5–6(–8) mm long; lobes 5, unequal, deltate, 1–2 mm long, ½ tube length. Corolla pink, mauve, or white, tube 9–12(–15) mm

long, bent and expanded distally above calyx, densely pubescent; lobe of lower lip 2–4 × 1 mm, tips acute, upper lip 2–4 × 2–4 mm, tips acute.

The subspecies is endemic to the relatively wet, rocky-plateau grasslands in West Africa between 13°N and 6°10′N (Fig. 5); its range extends from Senegal to Cameroon.

Selected specimens examined. BURKINA FASO. **Haut Bassins:** 18 km N of Banfora, 10°39′N, 4°50′W, *Leeuwenberg 4357* (K, MO). CAMEROON. **Northern:** Mont Boulorb, 5 km N of Maroua, 10°37′N, 14°22′E, *Letouzey 624* (K). GAMBIA. *Hayes 539* (K). GHANA. **Eastern:** 2 mi. NE of Kwahu-Tofo on road to Adawso, 6°15′N, 0°15′W, *Innes 909* (K); 3 mi. N of Kwahu-Tafo, 6°17′N, 0°20′W, *Harris 195* (K). **Northern:** 10 mi. from Lumbuga, 9°20′N, 2°5′E, *Morton 8795* (K); 2 mi. beyond Kwaha-Tafo on Mankrong Road, 6°10′N, 0°18′W, *Morton A663* (K); Afram Glams, 6°50′N, 0°25′W, *Onsow 709* (K); Damongo, Yendi, 9°17′N, 0°22′E, *Hepper & Morton A3110* (K); Kwaha-Tafo, 6°10′N, 1°0′W, *Hall 131, 260* (K); Okroso to Otiso Ferry, 10°0′N, 0°25′E, *Hepper & Morton A3039* (K); Onyaboni to Jaketi, *Morton A3016* (K); Sesiamango, *Thomas D138* (K). GUINEA. **Northern:** Seriba, Gaoual, 11°50′N, 13°10′W, *Adam 14812* (MO). **Southern:** N'zerekore, 7°40′N, 8°50′W, *Adam 26898, 27661* (MO). IVORY COAST. **Northeast:** Dabakala, 45 km NW Dabakala, 8°32′N, 4°9′W, *Geerling & Bokdam 2029* (MO). NIGER. *Barter 1169* (GH). NIGERIA. **Bauchi:** Bauchi Plateau, 10°25′N, 9°55′E, *Lely 83* (K); 10°20′N, 9°45′E, *Lely P83* (K, MO). **Kaduna:** 3 mi. N of Zaria, 11°8′N, 7°43′E, *Milne-Redhead 5043* (K); Kaduna, 10°31′N, 7°25′E, *Hill 51* (K); near Zaria, 11°7′N, 7°43′E, *Dalziel 407* (K); Riruwai-Kano Hills, 11°15′N, 8°17′E, *Carpenter 192* (K); Zaria, Mando, Gayam, 10°27′N, 7°25′E, *Keay 25833* (K); Zaria, Samaru, 11°5′N, 7°43′E, *Harris 11* (K); N Nigeria, *Pobeguin 364* (K). **Oyo:** 8 mi. E of Igboho, Upper Ogun Forest Reserve, 8°47′N, 4°0′E, *Keay s.n.* (K); Kogosti, 27 mi. E of Ilesha, 7°35′N, 4°58′E, *Lowe 3378* (K). **Plateau:** Vom, Bauchi Plateau, 9°40′N, 8°48′E, *Young 185* (K). SENEGAL. **Casamance:** Ziguinchor, Bayotter, 12°35′N, 16°12′W, *Adam 13724* (MO). **Oriental:** Niokolo-Koba, 13°0′N, 13°0′W, *Berhaut 1630* (K); Tambacounda, Niokolo-Koba, 13°5′N, 13°0′W, *Adam 14200, 26891, 26897* (MO). SIERRA LEONE. Kafari (Malal), *Bakshi 146* (K); Lake Sonfon, *Gledhill 285* (K). **Northern:** Buyabuya Scarcies, 9°45′N, 12°10′W, *Elliott 4279* (GH); Falaba, 9°52′N, 11°20′W, *Elliott 5207* (K, MO); Loma Manza, 9°15′N, 11°2′W, *Thomas 155* (K); near Mongo, Bure Makonte Chiefdom, 9°40′N, 11°50′W, *Glanville 241* (K), *Adames 224* (K); Sumbuya, 7°39′N, 11°58′W, *Thomas 603* (K); Rhombe Swamp, *Adames 146* (K); Robis, *Jordan 190* (K).

In summary, we recognize six subspecies of *S. bilabiata*, the five subspecies originally proposed by Hepper (1960) in addition to *S. bilabiata* subsp. *linearifolia*. These form a natural group: they are generally autogamous, perennials, unbranched, have strongly bilabiate corollas, winged stems, and occur in small populations. Many of the morphological features used to distinguish other species, such as heights and sizes, overlap in this species complex, making them unreliable characters.

7. Striga brachycalyx Skan, Fl. Trop. Afr. 4(2): 403. 1906. TYPE: Nigeria. Nupe, *Barter 1858* (holotype, K!).

Striga warneckei Engl. ex Skan, Fl. Trop. Afr. 4(2): 414. 1906. TYPE: Togo. *Warnecke 201* (isotypes, BM!, K!).

Annual, to 70 cm tall, slender, branched from middle, scabrous, hispid, stem square, furrowed. Leaves (5–)20–37(–50) × 1(–2) mm, subopposite, linear, ascending or spreading, longer than internodes, margin entire, veins obscure. Lower bracts 5–20 × 1 mm, linear, as long as or longer than calyx, upper bracts subulate, shorter than calyx. Flowers alternate, forming somewhat open racemes, raceme shorter than the vegetative stem. Calyx 5-ribbed, 3–6 mm long; tube 1.5–3 mm long; lobes 5, almost equal, linear, 1–3.5 mm long, about the same length as tube. Corolla purple with white center, tube (6–)9–19 mm long, bent and expanded distally above calyx, sparsely glandular-pubescent; lobes of lower lip 2–3(–5) × 1–2 mm, tips obtuse, upper lip 1–2(–4) × 2–4 mm, obovate.

Striga brachycalyx is widespread and often common in dense stands in the savannas of west and central Africa between 13°12′N and 5°17′N (Fig. 7). Its range extends from Ivory Coast into Burkina Faso, Mali, Ghana, Togo, and Nigeria, reaching its eastern limits in Sudan. It is also known from Congo. This species is morphologically homogenous throughout its range. *Striga brachycalyx* resembles *S. aspera*, but can be distinguished by its smaller flowers and more slender stems. The two species are sympatric, found in relatively drier savannas, and frequently encountered in large populations. Unlike *S. aspera*, which occasionally invades agroecosystems, *S. brachycalyx* is not known to damage grains even though it is very common.

Selected specimens examined. BURKINA FASO. **Center East:** 5 km N of Tenkodogo, 12°0′N, 0°19′W, *Safa & Musselman* 10/9/87 (ODU). **Center West:** 5 km W of Godi, 11°55′N, 2°24′W, *Safa & Musselman* 10/12/87 (ODU). **Central:** 1 km S of Kamboiense, 12°25′N, 1°40′W, *Musselman 6118* (ODU). **Haut Bassins:** 5 km S of Banfora, 10°37′N, 4°44′W, *Safa & Musselman* 10/13/87 (ODU). **Northern:** 5 km N of Gourcy, 13°12′N, 2°22′W, *Safa & Musselman* 10/10/87 (ODU). **Volta:** near Boromo and Laba, 11°50′N, 2°55′W, *Raynal 2282* (K). DEMOCRATIC REPUBLIC OF CONGO. **Kasai Oriental:** Tumba Camp, Kasumanyense Mbuga, Rukwa Valley, 3°7′S, 23°34′E, *Siame 144A* (BM). GHANA. Ayafie, *Adams 4693* (K). **Northern:** Bole, 9°5′N, 2°29′W, *Morton A3295* (K). **Upper:** 4 mi. from Tono, Navrongo, 10°57′N, 1°40′W, *Irvine 4668* (K). IVORY COAST. **Northern:** Kor-

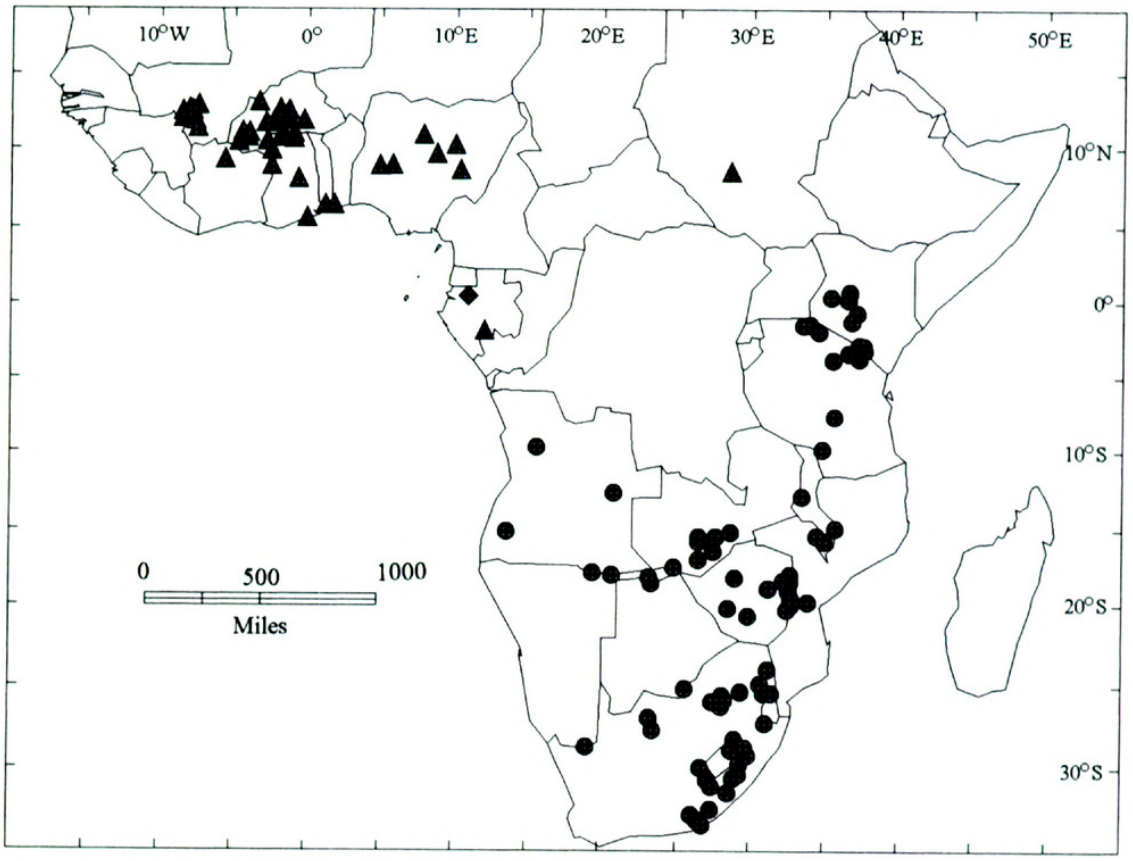

Figure 7. Distribution based on specimens of *Striga brachycalyx* (triangle), *S. elegans* (circle), and *S. hallaei* (diamond).

hogo, 10 km SW of Korhogo, 9°27′N, 5°38′W, *Riches 243* (K). MALI. **Koulikoro:** 12 km N of Oulessebougou, 12°0′N, 7°40′W, *Musselman & Mohamed* 9/30/88 (ODU). **Sikasso:** 6 km from Bougouni, 11°32′N, 7°30′W, *Raynal 22196* (K). NIGERIA. **Bauchi:** Bauchi Plateau, 10°25′N, 9°55′E, *Lely P567* (K). **Benue:** Abinsi, 7°20′N, 9°25′E, *Dalziel s.n.* (K). **Gongola:** Bogalo, close to River Benue, 8°45′N, 10°15′E, *Talbot 312* (K). **Kaduna:** Zaria, Samaru, 11°5′N, 7°43′E, *Harris 4, 7* (K). **Kwara:** Ilorin, 8°30′N, 4°32′E, *Parkinson* 9/17/86 (ODU). **Niger:** Bida/Mokwa Junction, 9°8′N, 5°40′E, *Mansfield* 9/4/78 (ODU). TOGO. **Southern:** Barani-Ideppe, 6°30′N, 1°45′E, *Kersting 665* (K). **Southern:** Togo Forest, 6°29′N, 1°9′E, *Anonymous s.n.* (US).

8. Striga chrysantha A. Raynal, Bull. Jard. Bot. Belg. 39: 378. 1969. TYPE: Central African Republic. Zemio-Rafai, *Descoings 12466* (holotype, P!).

Annual, small, < 12 cm tall, tufted, scabrous, densely pubescent, stem obtusely square. Leaves < 10 × 2(–3) mm, lanceolate, scale-like, shorter than internodes, margin entire, veins obscure. All bracts similar, 6 × 2 mm, lanceolate, shorter than calyx. Flowers alternate in rather dense spikes, spike as long as vegetative stem. Calyx 10-ribbed, 8–15 mm long; tube 6–13 mm long; lobes 5, subequal, deltate, 2 mm long, much shorter than tube. Corolla bright yellow, tube slender, 20–25 mm long, bent and expanded distally above calyx, glandular pubescent; lobes of lower lip 15 × 8 mm, spreading, broadly round, upper lip 8 × 10 mm, reflexed backward, emarginate.

Striga chrysantha is from the southern region of the Central African Republic and northern Democratic Republic of Congo (Raynal-Roques, 1969). It occurs between 3°40′N and 5°20′N (Fig. 8). The 10-calyx ribs, indumentum, and the yellow corolla suggest a relationship among this species, *S. lutea*, and *S. hirsuta*.

9. Striga dalzielii Hutch., Fl. W. Trop. Afr., ed. 1(2): 226. 1931. TYPE: Nigeria. Zungeru, *Dalziel 168* (holotype, K!).

Annual, 19–35 cm tall, stiffly erect, unbranched, scabrous, densely ciliate with long (1 mm), divergent hairs, stem square. Leaves 15–30 × 4–7 mm, 2-veined, opposite, linear, becoming reduced along the stem, as long as or longer than internodes, margin toothed. All bracts similar, 8–18 × 4 mm, linear, enclosing calyx, densely hispid along margins and midrib. Flowers sessile, imbricate, forming very dense spikes, spike shorter than vegetative stem. Calyx 10-ribbed, 5–8 mm long; tube 3–5 mm long; lobes 5, unequal, lanceolate, 2–3 mm long,

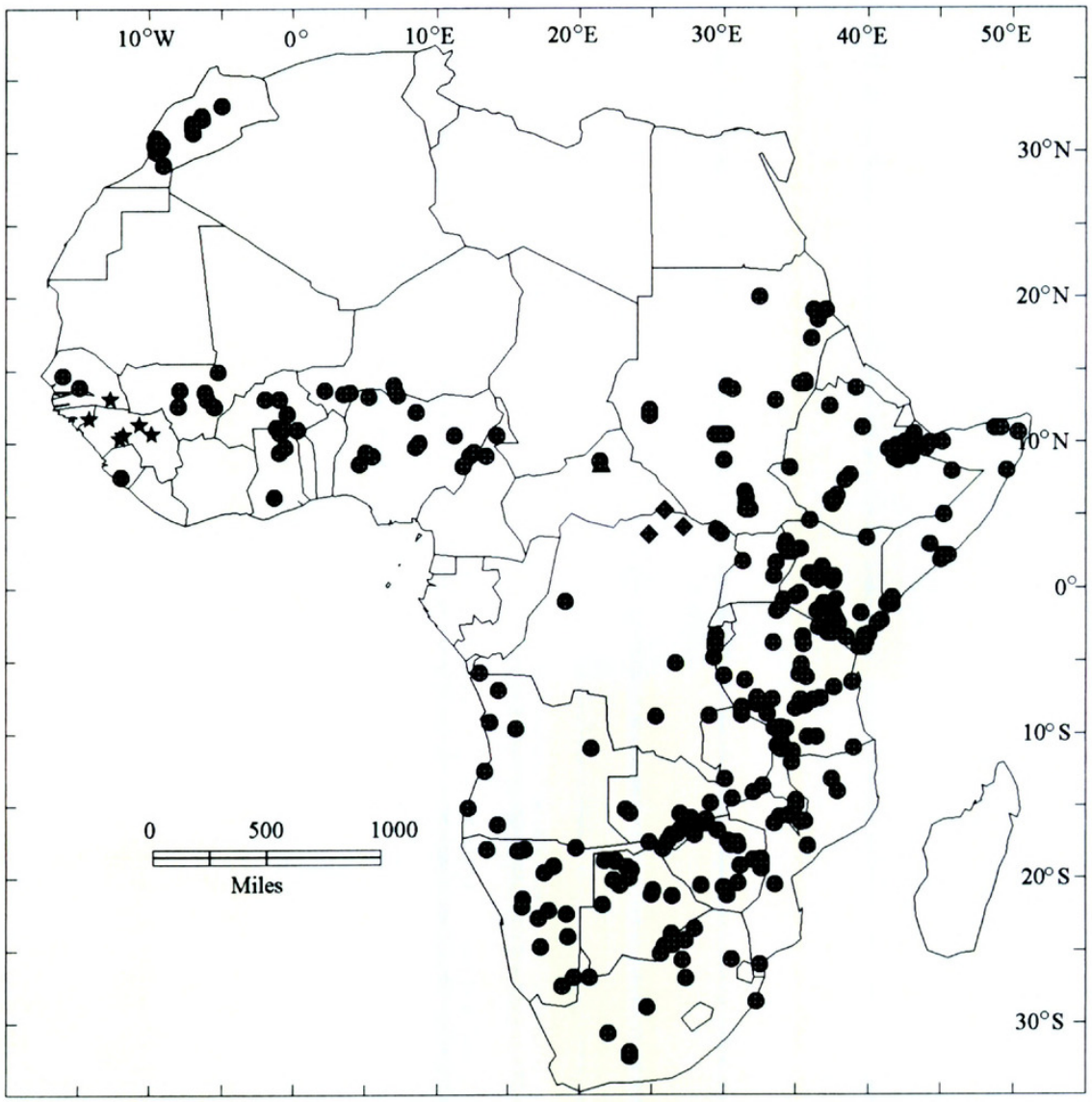

Figure 8. Distribution based on specimens of *Striga chrysantha* (diamond), *S. gastonii* (triangle), *S. gesnerioides* (circle), and *S. lepidagathidis* (star).

shorter than tube. Corolla pink, tube 10–20 mm long, bent and expanded distally above calyx, glandular-pubescent; lobes of lower lip 3–8 × 3–5 mm, obtuse, upper lip 3–6 × 6 mm, emarginate.

Striga dalzielii occupies the wet Guinea savannas in Mali, Guinea, and Nigeria (Raynal-Roques, 1987). It resembles *S. klingii* and *S. macrantha*, but *S. dalzielii* has 10-calyx ribs whereas *S. klingii* and *S. macrantha* have 10–15 ribs. *Striga dalzielii* is characterized by its leaf-like bracts and long hispid hairs.

10. Striga elegans Benth., Companion Bot. Mag. 1: 363. 1836. TYPE: South Africa. *Burke 443/3591* (holotype, K!).

Plant annual, 30(–50) cm tall, stiffly erect, unbranched or with 2 or 3 branches from base, scabrous, densely hispid, stem obtusely square, furrowed. Leaves 10–20(–30) × 2–3 mm, opposite, linear or lanceolate, shorter than internodes, margin entire, veins obscure. All bracts similar, 3–12 × 1–2 mm, lanceolate, shorter than calyx. Flowers opposite in dense racemes, raceme shorter than vegetative stem. Calyx 10–15-ribbed, 8–13 mm long; tube 6–7(–9) mm long; lobes 5 equal or 6 unequal, linear to lanceolate, 2–5 mm long, shorter than tube. Corolla brilliant scarlet, with yellow throat, tube 14–18 mm long, bent and expanded distally above calyx, densely glandular-pubescent; lobes of lower lip 5–10 × 3–5(–7) mm, ovate, upper lip 3–5 × 6–11 mm, emarginate.

Striga elegans is common in East and South Africa between 00°30′S and 33°30′S (Fig. 7). Its range extends from central Kenya south into Tan-

zania, Malawi, Zambia, Zimbabwe, Mozambique, Swaziland, Botswana, and Lesotho. *Striga elegans* shows considerable variation in corolla size and color that does not seem to correlate with geography. This beautiful species resembles *S. asiatica* and the two are sympatric in East Africa (see notes under *S. asiatica*), but it can be distinguished from *S. asiatica* by its relatively short, dense inflorescence with opposite flowers and large brilliant scarlet corolla lobes. Authentic crop loss from this parasite has not been reported.

Selected specimens examined. ANGOLA. **Huila:** Quilengues, Binde, 15°S, 13°30′E, *de Menezes A.377* (K). **Malange:** Pungo Andongo, 9°40′S, 15°30′E, *Welwitsch 5851* (K). **Moxico:** between River Namavumba and River Lukaia, 12°40′S, 20°45′E, *Milne-Redhead 4018* (K). BOTSWANA. **Ngamiland:** Leshums Valley, 18°30′S, 23°20′E, *Holub 1834* (K). **Southern:** Lobatse, 25°11′S, 25°40′E, *Tapscott 2548* (K). KENYA. **Central:** Nairobi, 1°20′S, 36°48′E, *Perceval 1901* (MO). **Coast:** Loitokitok, NE of Kilimanjaro 3°37′S, 37°20′E, *Rogers 560* (K). **Rift Valley:** Rumuruti, Laikipia, 50 km N of Colchecio Lodge, 0°19′N, 36°34′E, *Hepper & Jaeger 6618* (K, MO). LESOTHO. **Northern:** Mont-aux-Sources, 28°56′S, 28°50′E, *Grant 2212387* (MO). MALAWI. **Central:** Kasungu, Chipala Hill, 4 mi. N of Kasungu, 12°55′S, 33°29′E, *Robson & Jackson 1179* (K). MOZAMBIQUE. Paraia Sepulveda, *Lavranos 4265* (MO). NAMIBIA. **Kavango:** 2.4 mi. E masari Camp on road to Nyangana, 18°0′S, 20°41′E, *de Winter 4087* (K). SOUTH AFRICA. **Bechuanaland:** Little Klibbolikhonni, 27°0′S, 23°15′E, *Burchell 2482* (K). **Cape:** Albany, Woest Hill, 33°0′S, 26°20′E, *Bayliss 4526* (GH, MO). **Karasburg:** Orange River Colony, 28°45′S, 19°0′E, *Walich 1278* (K). **Natal:** between Mooi River and Estcourt, 29°18′S, 29°56′E, *Wood 394* (K). **Orange Free State:** Walton, 12 km S of Harrismith, 28°18′S, 29°3′E, *Jocobsz 218* (K). **Transkei:** Griqualand, 30°40′S, 29°0′E, *Tyson 1368* (MO). **Transvaal:** Randburg, Kelland, 26°6′S, 27°59′E, *Liebenberg 8581* (MO). SWAZILAND. **Louwsburg:** 2 mi. E of Goedgegun, 27°20′S, 31°7′E, *Ross 1743* (K, MO). TANZANIA. **Arusha:** Arusha National Park, 3°25′S, 36°37′E, *Richards 25019* (K). **Iringa:** 8 km E of Kilolo, which is 30 km SE of Iringa, 7°40′S, 35°40′E, *Peterson 833* (K). **Kilimanjaro:** E Kilimanjaro Mountain, 30°0′S, 37°38′E, *Haarer 637* (K). TANZANIA. **Mara:** Chamliho Hill, Ikizu Musoma, Lake Province, 1°30′S, 33°58′E, *Tanner 1690* (K). **Iringa:** Kyimbila, N of Lake Nyasa, 9°50′S, 34°50′E, *Stolz 2494* (GH, MO). ZAMBIA. **Lusaka:** 129 km E of Lusaka, 15°15′S, 28°40′E, *Robinson 6174* (K). **Southern:** Kalomo, Kanchele, 17°0′S, 26°30′E, *Astle 1571* (K). ZIMBABWE.**Maincaland:** 6 mi. N of Troutbeck, Inyanga, 18°21′S, 32°15′E, *Robinson 1961* (K). ZIMBABWE. **Mashonaland South:** Harare, Circular Drive, 17°50′S, 31°3′E, *Hughes s.n.* (ODU). **Matabeleland South:** Belingwe (Mberengwa), Mount Buhwa, 20°37′S, 29°55′E, *Wild 4315* (K). **Midlands:** Gokwe, 18°9′S, 29°0′E, *Bingham 1178* (MO).

11. Striga forbesii Benth., Companion Bot. Mag. 1: 364. 1836. TYPE: Mozambique. *Forbes s.n.* (holotype, K!).

Annual, 37–72 cm tall, stiffly erect, unbranched or with 2 to 4 branches below middle, scabrous to hispid, stem square, furrowed. Leaves 15–40(–90) × 4–12 mm, opposite, lanceolate, coarsely toothed, 3- to 5-veined, usually shorter than internodes. Lower bracts 20–50(–90) × 3–12 mm, leaf-like, longer than calyx, upper bracts shorter than calyx. Flowers opposite in open racemes, raceme shorter than vegetative stem. Calyx 10–15-ribbed, 9–14 (–20) mm long; tube 4–6 mm long; lobes 5, equal, broadly lanceolate, 5–9(–14) mm long, longer than tube. Corolla salmon-pink, tube 20–25 mm long, bent and expanded distally above calyx, densely glandular-pubescent; lobes of lower lip 6–9 × 3–6 mm, obovate, spreading, upper lip 3–6 × 6–9 mm, emarginate.

Striga forbesii ranges between 14°30′N and 28°30′S (Fig. 9). It is common in the Sudanian savannas from Senegal to Somalia and extends into East Africa reaching its southern limits in the Republic of South Africa. A plant of relatively wet open areas and swampy soils, *S. forbesii* can cause damage to irrigated crops such as sugar cane in Somalia (Musselman, unpublished).

Knepper et al. (1991) showed that some populations of *S. forbesii* are distylous. Flowers either had styles strongly exserted from the corolla tube exposing the stigma, or stigmas were among or just below the epipetalous stamens, with increasing possibilities of self-pollination.

Striga forbesii resembles *S. latericea.* Both are sympatric in East Africa, occupy wet habitats, and have unique salmon-pink corollas. No work has been done to demonstrate interfertility between these two species. *Striga forbesii* is distinguished from *S. latericea* by its annual habit, stiff hairs that give the plant a harsh texture, coarsely toothed and broader leaves, and shorter corollas with smaller lobes and a brighter salmon-pink color. The corolla color is darker in *S. latericea.*

Selected specimens examined. ANGOLA. **Cuanza North:** Cuanza, 8°50′S, 15°0′E, *Johnston 83* (K). **Moxico:** between River Masanu and River Katetele, 13°0′S, 21°0′E, *Milne-Redhead 4155* (BM, K). BOTSWANA. **Chobe:** near Pandamentenga, 18°9′S, 24°24′E, *Musselman* 4/9/86 (ODU). **Ngamiland:** NE Maun, 20°0′S, 23°26′E, *Lambrecht 479* (K). **Bujumbura:** Karazi, 3°23′S, 29°22′E, *Lewalle 335* (K). **Ruand:** Kigungee Territory, Biumba, 2°12′S, 30°32′E, *Alcool 4142* (K). CAMEROON. **Northern:** 5 km W Marona, 10°35′N, 14°0′E, *de Wilde et al. 2954* (K). DEMOCRATIC REPUBLIC OF CONGO. **Bandundu:** Kisambo, Kwango, 6°25′S, 18°10′E, *Anonymous 3384* (K). **Equateur:** Olru-Uele, 4°0′N, 22°35′E, *Lebrun 3557* (GH). **Haut Zaire:** Oriental, Dungu, Garamba National Park, 3°40′N, 28°30′E, *Jaeger 1225* (K). **Katanga:** Elisabethville, 11°40′S, 27°28′E, *Quarre 1451* (K). **Oriental:** Kasai, Gandajika, 6°42′S,

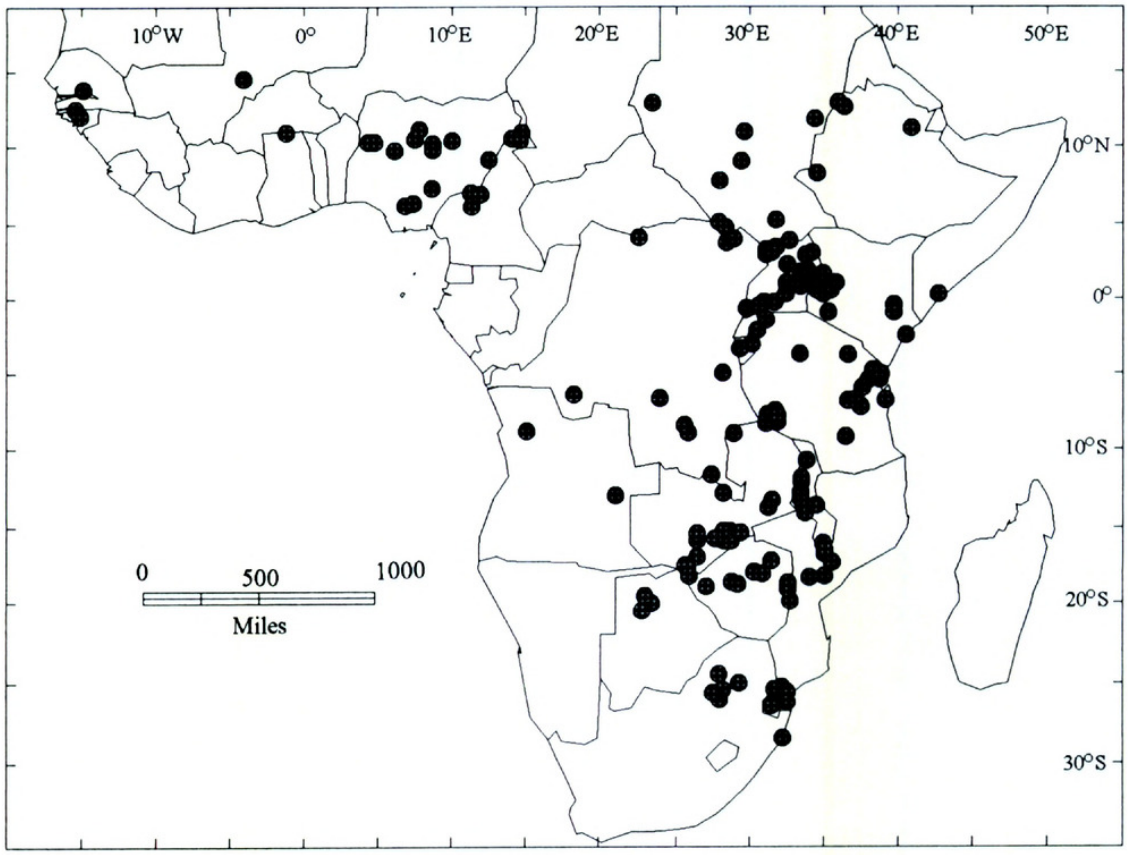

Figure 9. Distribution based on specimens of *Striga forbesii* (circle).

34°0′E, *Liben 2038* (K). **Shaba:** River Lualaba, 50 km downstream from Bukama, 8°55′S, 25°55′E, *Paterson 59* (K). ETHIOPIA. **Ilubabor:** Ilubabor, Gambela, Baro River, 8°16′N, 34°35′E, *Ash 544* (K). **Welo:** Asaeta, Awash Valley, 33 km S of Tandah, 11°17′N, 40°54′E, *Ash 2259* (K). GAMBIA. **Eastern:** Kuntaur, 13°49′N, 14°52′W, *Ruxton 67, 149* (K). **Upper:** Bolgatanga, Crocodile Pool, 10°50′N, 0°50′W, *Hall 558* (K). GUINEA BISSAU. **Northern:** between Farim and Bigene, 12°10′N, 15°15′W, *Anonymous 3063* (K). **Western:** Sao, Fa, 12°27′N, 16°17′W, *Guerra 3812* (K). KENYA. 30 mi. W of Bwa, *Wham* 26/2/24 (K). **Coast:** Kipini, Mlango Ya Simba, 2°30′S, 40°32′E, *Greenway & Rawlin 9463* (K). **Narok:** Mara Plains, 1°0′S, 35°20′E, *Stewart 327* (K). **Rift Valley:** Chyulu-Goohills, 1°0′N, 35°50′E, *Bally 8072* (K). **Western:** Uasingishu Plateau and Trans Nzoia, 0°30′N, 34°35′E, *Dowson 674* (K). MALAWI. **Central:** 2 mi. N of Mzambazi, 13 mi. S of Mperembe, 11°58′S, 33°33′S, *Pawek 13954* (K). **Kyimbila:** Nyasa Hochland-Station, *Stolz 213* (GH, US). **Northern:** 16 mi. N of Rumpi, 10°45′S, 33°54′E, *Pawek 13913* (K). **Southern:** Lower Shire Valley, Elephant Marsh, 16°20′S, 35°0′E, *Robertson 5* (K). MALI. **Massina:** Mopti, 14°30′N, 4°8′W, *Lean 37* (K). MOZAMBIQUE. **Maputo:** Maputo (Lourenco Moazgues), Vila Luisa, 25°45′S, 32°35′E, *Grandraux & Delemos 7913* (K). **Sofala:** near Massara, 18°20′S, 34°5′E, *Anonymous 1858* (K). **Zambezia:** Morrumbala Plains, 17°22′S, 35°36′E, *Kirk* 15/1/63 (K). NIGERIA. **Amambra:** Udi, upper Nau River, 6°18′N, 7°20′E, *Anderson 1364* (K). **Bauchi:** Bauchi Plateau, 10°27′N, 9°57′E, *Lely P369* (K). **Bendel:** 3 mi. N Asaba, 6°7′N, 6°47′E, *Killick 234* (K). **Cross River:** Oban, 5°17′N, 8°35′E, *Talbot 308* (BM). **Gongola:** Mambilla Plateau, 6°5′N, 11°14′E, *Chapman 2935* (K). **Kaduna:** 2 mi. NE of Kaduna, 10°32′N, 7°26′E, *Jackson 254* (K). **Niger:** Zungeru, 9°48′N, 6°5′E, *Dalziel 167* (K). **Plateau:** Jos Plateau, 9°50′N, 8°40′E, *Batten-Poole 371* (K). **Sokoto:** 10 mi. N Bussa, 10°20′N, 4°35′E, *Cook 386* (K). SOMALIA. **Jubba House:** Middle Juba, Mareeri, 0°25′N, 42°42′E, *Musselman 7086* (ODU). SOUTH AFRICA. **Natal:** Inanda, 26°7′S, 28°3′E, *Wood 440* (K). **Qriqualand:** N of Kaap, Barberton, 28°30′S, 23°45′E, *Thorneiop 2206* (K). **Transvaal:** Crocodile River, beyond Brits, 25°42′S, 27°45′E, *Dyer & Merdoom 3421* (K). SUDAN. **Bahr Al-Ghazal:** Wau, 7°46′N, 28°2′E, *McCintosh 57k, 109k* (K). **Equatoria:** Mount Nakbi between Yambio and Tambura, 5°0′N, 28°5′E, *Myers 6997* (K). **Jungali:** 20 km N of Kongor, 7°10′N, 31°21′E, *Lock 82/31* (K). **Kassala:** Metemma, Gallabat, 12°59′N, 36°0′E, *Schweinfurth 179* (K). **North Darfur:** Darfur, Zalingei, 12°45′N, 23°29′E, *Lynes 577* (BM). **South Kurdufan:** Kadugli, Nuba Mountains, 11°1′N, 29°41′E, *Bashir s.n.* (K). SWAZILAND. **Central:** Tshaneni, Swaziland Irrigation Scheme, 26°30′S, 31°30′E, *Parker 1066* (ODU). TANZANIA. **Morogoro:** Kilosa, 6°50′S, 36°50′E, *Robertson 676* (K). **Pwani:** Dar es Salaam, University College, 6°47′S, 39°18′E, *Mwasumbi 10487* (K). **Rukwa:** Milepa, 8°3′S, 31°56′E, *Lea LR20* (K). **Shinyanga:** Shinyanga, 3°45′S, 33°27′E, *Koritschoner 2059* (K). **Tanga:** Handeni, 5°27′S, 28°2′E, *Ryae H40/33* (K). **Ziwa:** Bukoba, Kakindu, 1°30′S, 31°10′E, *Haarer 2307* (K). **Zanzibar:** Pemba, *Vaughan 402, 1613, 1664* (K). UGANDA. **Busoga:** Bugerere, 0°45′N, 33°30′E, *Liebenberg 1532* (K). **Eastern:** Elgon, Pemba, 1°10′N, 34°30′E, *Fames 1905* (K). **Karamoja:** Honyili Ridge, 2°25′N, 33°40′E, *Wilson 880* (K). **Nile:** Arua West Hill, 3°1′N, 31°10′E, *Hazel 442* (K). **North Buganda:** Kakoge, Mengo, 1°0′N, 32°30′E, *Brown 1732* (K). **Northern:** Lango, 2 km W of Ngunyboke, 2°13′N, 32°34′E, *Lye 4747*

(K). **South Buganda:** Masaka Rest Camp, 0°20′S, 31°44′E, *Chancellor 72* (K). **Southern:** Mbarara, 0°37′S, 30°39′E, *Maitland 103* (K). ZAMBIA. **Copperbelt:** Kitwe, 12°54′S, 28°17′E, *Fanshawe 10003* (K). **Eastern:** Luangwa Valley, 13°20′S, 31°35′E, *Astle 4471, 4570* (K). **Luapula:** 5 km E of Lusaka, 15°28′S, 28°19′E, *King 260* (K). **Shaba:** 3 mi. NE Ndola-Waterlogged Dambo, 12°58′S, 28°46′E, *Draper 25* (K). **Southern:** Kafue River, at Lubalansuki, Namwala District, 15°50′S, 26°30′E, *Mitchell 24/78* (K). ZIMBABWE. **Manicaland:** Melsetter, 6 mi. S Mutambara Village, 19°50′S, 32°47′E, *Whiteside 107793* (K). **Mashonaland North:** Mazore, Shamva, near Lions Heads, 17°17′S, 31°30′E, *Wild 599* (K). **Mashonaland South:** Makwiro, 18°0′S, 30°20′E, *Smith 22673* (K). **Matabeleland North:** Urungwe National Park, 271 km from Salisbury on Chirundu Road, 18°57′S, 27°6′E, *Philcox et al. 8796* (K). **Midlands:** Kwe Kwe, 18°55′S, 29°49′E, *Musselman 124* (K).

12. Striga gastonii A. Raynal, Bull. Mus. Natl. Hist. Nat., B, Adansonia, 3: 225–227. 1987. TYPE: Chad. Danamadji, *Audru 1245* (holotype, P not seen; isotype, ALF not seen).

Perennial, 7 cm tall, succulent, tufted, glabrous, stem obtusely square. Leaves scale-like, 1–4 × 1–2 mm, lanceolate, appressed, longer than internodes, margin entire, veins obscure. All bracts similar, 3 × 1–2 mm, lanceolate, shorter than calyx. Spike dense, longer than vegetative stem. Calyx 5-ribbed, 3–5.5 mm long; tube 2–4 mm long; lobes 5, subequal, subulate, 1–2 mm long, shorter than tube. Corolla purple, tube 8 mm long, bent and expanded distally above calyx, sparsely glandular-pubescent, weakly bilabiate; lobes of lower lip 4 × 1–2 mm, obovate, upper lip 1 × 1–2 mm, emarginate, tips obtuse.

Striga gastonii is endemic to the lateritic plains in southern Chad and Central African Republic (Fig. 8) and is parasitic on *Lepidagathis* (Acanthaceae) species (Raynal-Roques, 1987). It is a small plant that resembles *S. gesnerioides* var. *minor* Santojuan in its overall appearance. The relationship of *S. gastonii* to the *S. gesnerioides* parasitizing *Lepidagathis* in India (e.g., Saldanha, 1963) should be investigated. *Striga gastonii* may be a host-specific strain of *S. gesnerioides*.

13. Striga gesnerioides (Willd.) Vatke, Oesterr. Bot. Z. 25: 11. 1875. *Buchnera gesnerioides* Willd., Sp. Pl. 338. 1801. TYPE: India. *Koenig s.n.* (B 11573 not seen).

Buchnera orobanchoides R. Br., Flora 2: 388, t.2. 1832. *Striga orobanchoides* (R. Br.) Benth., Companion Bot. Mag. 1: 361. 1836. TYPE: Ethiopia. *Salt s.n.* (holotype, BM!).

Striga orchidea Hochst., Fl. XXIV. 43. 1841. TYPE: *Kotschy 387* (holotype, K!).

Striga gesnerioides var. *minor* Santapau, Kew Bull. 1948: 491. 1949. TYPE: *Santapau 3072* (holotype, Blatter Herb., St. Xavier's College, Bombay not seen).

Annual or occasionally perennial, 12–30 cm tall, unbranched or branched from the base, usually succulent, drying black or brown, sparsely to densely hispid or pilose, stem terete or obtusely square. Leaves 4–10 × 1–3 mm, lanceolate, opposite/subopposite, scale-like, appressed, usually shorter than internodes, margin entire, veins obscure. All bracts similar, 2.5–6 × 2–3 mm, lanceolate, longer or shorter than calyx. Flowers opposite/subopposite in simple spikes, spike shorter or longer than vegetative stem. Calyx 5-ribbed, 4–9 mm long; tube 3–6 mm long; lobes 5, unequal or subequal, linear, deltate or lanceolate, 1–3 mm long, shorter than tube. Corolla creamy-white, blue, pink, purple, tube 8–14 mm long, bent and expanded distally above calyx, pubescent, with very few hairs or glandular hairs; lobes of lower lip 2–6 × 1.3–3 mm, obovate, spreading, upper lip 1–2 × 2–2–5 mm, indistinctly bilobed or emarginate, usually wider than long.

Striga gesnerioides is the most widely distributed of all witchweed species (Fig. 8) and is found between 33°10′N and 32°15′S, extending into Arabia and Asia. *Striga gesnerioides* was introduced into Florida in the United States (Sand et al., 1990) but has not become an agronomic problem.

Striga gesnerioides parasitizes only dicotyledons. Host selection, succulence, reduction of leaves, and tufted habit have been considered (see Boeshore, 1920) to represent a reduction in the direction of the holoparasitic Orobanchaceae. Thalouarn et al. (1991) found that *S. gesnerioides* has a weak capacity to fix CO_2. These features of morphology, host selection, and physiology distinguish *S. gesnerioides* from other members of the genus.

Selected specimens examined. (All collections of *S. gesnerioides* are listed here. Under each strain we have listed specimens representative of those strains). ANGOLA. **Benguella:** Benguella, 12°36′S, 13°20′E, *Gossweller 3540* (K). **Cunene:** Cahama, 16°19′S, 14°15′E, *Pearson 2421* (K). **Luanda North:** Catete, 9°2′S, 13°42′E, *Anonymous 9200* (K). **Lunda South:** Cazange, 11°2′S, 20°45′E, *Gossweller 647* (K). BOTSWANA. **Central:** Boteti Delta Area, S of Mopipi, 20°50′S, 25°5′E, *MacDonald 21* (K). **Desert:** 5 km NW of Bokspits, 26°51′S, 20°41′E, *Skarpe 52* (K). **Ghanzi:** 13 mi. S of Ghanzi on Lobatsi Road, 21°50′S, 21°36′E, *Brown 8282* (K). **Kweneng:** Artesia, 24°2′S, 23°26′E, *Mitchison* 1975 (K). **Ngamiland:** Mboma Island, 19°12′S, 23°18′E, *Smith 830* (K). **Southern:** Gaborone, Aedume, 24°42′S, 25°54′E, *Hansen 3375* (K). BURKINA FASO. **Central:** Korsimoro, 30 km from Kaya, 12°0′N, 1°0′W, *Raynal 22603* (K). **Northern:** 55 km from Ouahigouya, 13°0′N, 2°0′W, *Raynal 22613* (K). BURUNDI. **Bujumbura:** Magari, 4°44′S, 29°18′E, *Reekmans 9834* (K). **Rubindi:** Bururi, 3°56′S, 29°33′E, *Reek-*

mans 6926 (K). **Rusizi:** 14 km from Bujumbura, 3°20′S, 29°27′E, *Lewalle 1474* (K). CAMEROON. **Northern:** 5 km W of Maroua, 10°37′N, 14°12′E, *de Wilde & de Wilde-Duyfjes 29629* (K). CENTRAL AFRICAN REPUBLIC. **Bamingui-Bangoran:** Saline on Niao River, 2 km from confluence with Ground River, 8°42′N, 21°22′E, *Fay 3354* (K). CONGO. **Shaba:** Lubanda, Kivu Province, 5°10′S, 26°38′E, *Germain 5717* (K). DEMOCRATIC REPUBLIC OF CONGO. **Bandundu:** Tweya, 0°56′S, 18°58′E, *Robyn 1980* (K). **Haut Zaire:** Faradje-Olru, 3°44′N, 29°43′E, *Lebrun 3535* (MO). **Shaba:** Luvngu, 8°48′S, 25°17′E, *Linder 1966* (K). ETHIOPIA. **Arsi:** Lake Langano, 7°45′N, 38°45′E, *Ash 347* (K). **Gamo Gofa:** 12 km S of Arba Minch, 6°5′N, 37°40′E, *Gilbert et al. 345* (K). **Gonder:** Tana, 12°30′N, 37°20′E, *Pichi-Sermolli 1296* (K). **Ilubabor:** Gambela, 8°18′N, 34°37′E, *Ash 557, 1089* (K). **Ogaden Harerge:** E of Grawa, 8°50′N, 42°25′E, *Burger 2846* (K, US). **Shewa:** SW Shore of Lake Langano, 7°25′N, 38°25′E, *Gilbert & S.B. 1078* (K). **Tigray:** Takaze Valley, 13°43′N, 39°11′E, *Gilbert & Getachew 2958* (K). GAMBIA. **Eastern:** Kuntaur, 13°45′N, 14°40′W, *Ruxton 53* (K). GHANA. **Northern:** Tamale, 9°20′N, 0°59′W, *Irvine 4572, 4574* (K), *Hall 2058* (K). **Upper:** Bolgatanga, 10°45′N, 0°55′W, *Parker 2023* (K). **Volta:** Keta, Rest House, 5°55′N, 1°2′E, *Akpabla 36* (K). KENYA. **Coast:** Arabuko, Kilifi, 3°40′S, 39°50′E, *Graham 1675* (K). **Eastern:** Buna, 3°26′N, 39°54′E, *Gilbert 13104* (K). **Nyanza:** Karungu, Homa Mount Foot, 0°49′S, 34°9′E, *Twuner 6730* (K). **Rift Valley:** Chebloch, Eudo, Upper Kerio Valley, 0°22′S, 35°15′E, *Tweedie 2448* (K). MALAWI. **Northern:** 19 mi. S of Chilumba, 11°0′S, 33°54′E, *Pawek 9601* (K). **Southern:** Chiwembu, Mankhudwe Hill, 15°38′S, 34°32′E, *Smith et al. 5872* (K); Sombani Plateau, Mulanje Mountain, 16°10′S, 35°33′E, *Mouculie 574* (K). MALI. **Koulikoro:** Sotuba, 12°50′N, 7°59′W, *Raynal 22063* (K). **Massina:** Dioura, N Macina, 14°52′N, 5°16′W, *Davey s.n.* (K). **Segou:** between Dougouba and Markala, 13°0′N, 6°0′W, *Raynal 22565* (K). **Sikasso:** 4 mi. from Koutiala, 12°30′N, 5°30′W, *Raynal 22211* (K). MOROCCO. **Agadir:** Agadir, 30°30′N, 9°40′W, *Hettewy 52, 179, 186* (K), *Lynes 53* (BM). **Azilal:** near Demnate, 31°40′N, 7°3′W, *Balls 3022* (K). **Beni-Mellal:** Kesbeh, 32°20′N, 6°20′W, *Lewalle 10634* (BM). **Goulimime:** 1 km E of Tirhmi, 29°6′N, 9°5′W, *Miller et al. 615* (BM). **Quaovizert:** Moyen Atlas Mountain, 33°10′N, 5°0′W, *Jahandiez 149* (BM). **Southwest:** Oued Massa, between Agadir and Tiznit, 3°N, 9°35′W, *Davis 53515* (BM). MOZAMBIQUE. Liben, *Kuntze 94* (K). **Maputo:** Maputo (Lourenco Marques), 25°58′S, 32°32′E, *Balsinhas 152* (K). **Niassa:** Marrupa, slope of Mountain Kuwanko, 15 km on road to Nungo, 13°8′S, 37°30′E, *Jansen 8040* (K). **Sofala:** Chibabava, Lown Buzi, 20°25′S, 33°35′E, *Swynnerton 1413* (K). **Tete:** Tete, 16°13′S, 33°33′E, *Kirk* (K), *Peters 8* (K). NAMIBIA. Along road to Ethosha Pans National Park, *Musselman & Visser* 4/2/86 (ODU). **Gobabis:** 10 km E of Gobabis, 22°28′S, 19°5′E, *Wanntop 760* (K). **Great Namaqualand:** Jafelberg, 24°45′S, 17°15′E, *Smith 26* (K). **Grootfontein:** 11 mi. from Otavi-Grootfontein on flat between mountains, 19°38′S, 17°30′E, *Tolken & Hardy 919* (K). **Kaokoland:** Mopane, Otjivero, 18°0′S, 13°29′E, *Winter & Leistner 5368* (K). **Karasburg:** Grot Karasberg, Naruda Sud Ravine, 27°29′S, 18°45′E, *Pearson 8122* (K). **Karibib:** Damaraland Otisondu, 22°0′S, 15°56′E, *Seydel 4491* (K, US). **Kavango:** bank of Okavango River at Runyu, 17°56′S, 19°44′E, *Winter & Marais 4479* (K). **Keetmanshoop:** Keetmanshoop, 3 mi. W of Aroab, 26°51′S, 19°35′E, *Winter 3372* (K). **Mariental:** E Aranos, Farm Mara on the Botswana border, 24°2′S, 19°10′E, *Vuuren & Giess 1132* (K). **Omaruru:** Farm Okandjon North, 30 km NW of Omaruru, 21°26′S, 16°0′E, *Wanntop 814* (K). **Windhoek:** 6 mi. E of Homestead on Nossob River, Gibeon, Farm Haruchas, 22°15′S, 17°48′E, *Leistner 1817* (K). **Windhoek:** Avis Dam, 22°46′S, 17°7′E, *Liebenberg A516* (K). NIGER. **Maradi:** 10 km NW of Maradi, 13°45′N, 7°0′E, *Parker 2044* (K). **Niamey:** Niamey, 13°35′N, 2°10′E, *Olufsen 479* (K). NIGERIA. **Bauchi:** 10 mi. from Gombe on Biu Road, 10°27′N, 11°14′E, *Daramola 62346* (K). **Gongola:** Kilba Hills and Yola, 9°20′N, 12°35′E, *Dalziel 300* (K). **Kwara:** Ilorin, 36 mi. from Ilorin, on Ilorin–Bacita Road, 8°30′N, 4°35′E, *Gbile et al. 63394* (K). **Niger:** between Mokwa and Bida, 9°3′N, 5°30′E, *Lowe A12* (K). **Oyo:** Ado Rock, 7°40′N, 5°15′E, *Keay 25446* (K). **Plateau:** Jos Plateau, 9°40′N, 8°35′E, *Lely 535* (K). RUANDA. **Southern:** Rumonge, along Lake Tanganyika, 3°58′S, 29°25′E, *Shantz & Tanner 4196* (K). SENEGAL. Djembering, *Broadbent 158* (K), *Farmer 131* (K). SIERRA LEONE. **Western:** Buyabuya, 12°10′N, 7°50′W, *Elliott 4279* (K). SOMALIA. **Bari:** Galgallo, 64 km SW of Bosaso, 10°58′N, 49°1′E, *Bally & Melville 15841* (K). **Bay:** Buur Heybo (bur Eibi), 2°59′N, 44°16′E, *Thulin & Mahamed 7088* (K). **Jubbada Hoose:** 16 km S of Badade, 1°4′S, 41°23′E, *Gillett et al. 25136* (K). **Mogadisho:** Mogadishu International American School, 2°7′N, 45°32′E, *Kuchar 15312* (K). **Nugaal:** Nugaal Valley, 8°5′N, 49°35′E, *Hemming & Watson 30216* (K). **Sanaag:** Sugli, 10°58′N, 48°53′E, *Ballenetto 277* (K). **Woqooyi Gelbeed:** Borama, 10°2′N, 43°10′E, *Gilbert 4723* (K). SOUTH AFRICA. **Cape:** bank of Kareiga River, Bathurst District, 32°15′S, 23°30′E, *Bayliss 5212* (GH). **Natal:** Inomda, Amonopl Grass, *Wood 4276* (K). **Orange Free State:** Kimberly, Dronfield, 28°54′S, 24°41′E, *William 5975* (K). **Transvaal:** 9 mi. W of Krugersdorp on Farm Gladysvale, 26°5′S, 27°24′E, *Robin 3839* (K). SUDAN. **Bahr Al-Gebel:** Terakekka, 5°25′N, 31°42′E, *N.D.H 7361* (K). **Equatoria:** 10 km S of Bemmeiza, 40 km S of Bor, 5°55′N, 31°36′E, *Lock 82/44* (K). **Kassala:** Gedaref, Um Shagara, 14°2′N, 35°30′E, *Beshir 151* (K). **Lake Province:** near Baidit, 35 km N of Bor by Kongor Road, 6°30′N, 31°30′E, *Lock 81/77* (K). **North Kurdufan:** Barah, Hadeid Sherifi, 13°38′N, 30°36′E, *Wickens 536* (K). **Red Sea:** Erkowit, 18°27′N, 36°32′E, *Jackson 2722* (K). **South Darfur:** 13 km S Nyala, 11°58′N, 24°51′E, *Wickens 3159* (K). **South Kurdufan:** G.T.Z. Farm, near Telo, 10°30′N, 30°E, *Musselman 6174* (K, ODU). **Upper Nile:** Bahr el Jebel, Sheikh Jowbe, 8°45′N, 30°E, *Brown 1644* (K), *Shellai 837* (K). TANZANIA. 1.5 mi. NE Dangani, *Drummond & Hemsley 3319* (K). **Arusha:** Lake Tanganyika, Mbulu, 3°52′S, 35°33′E, *Richards 4512* (K). **Dodoma:** Handeni, Kwa Mtono, 5°15′S, 35°25′E, *Archbold 2776* (K). **Iringa:** 19 km E of Ibuguziwa Ferry, 7°55′S, 35°35′E, *Bjronstad 1363* (K). **Kigoma:** Mahali Mountains, 6°0′S, 30°E, *Jefford et al. 53* (K). **Kilimanjaro:** Mrau Rombo, E Kilimanjaro, 3°7′S, 37°30′E, *Haarer 5127* (K). **Mara:** Lake Province, Musoma Town, 1°30′S, 33°48′E, *Tanner 3996* (K). **Mbeya:** Galula, S Saza, 8°37′S, 33°2′E, *Carter et al. 2479* (K). **Morogoro:** 10 km from base of Kitonga Gorge, 7°40′S, 36°15′E, *Lovett & Congdon 1404* (K). **Mpana:** Katabi Plains, 6°20′S, 31°30′E, *Sanane 1571* (K). **Mtwara:** Tunduru, 60 mi. from Masasi, 11°0′S, 39°0′E, *Richards 17965* (K). **Rukwa:** Rukwa Valley, 7°40′S, 32°20′E, *Pielou 130* (K). **Ruvuma:** 6.5 km E of Gumbiro, 10°15′S, 35°52′E, *Milne-Redhead & Taylor 10018* (K). **Shinyanga:** Shinyanga,

3°45′S, 33°27′E, *Burtt 3770* (K). **Singinda:** Doma, 7 mi. on Bahi to Kilimatinde Road, 5°54′S, 35°14′E, *Bidgood et al. 1204* (K). **Ufipa:** Kalambo Falls on Tanzania side of the river, 8°37′S, 31°15′E, *Richards 12813* (K). TOGO. **Northern:** near Dapaon (Dapango), 10°53′N, 0°16′E, *Ern et al. 1478* (K). UGANDA. **Busoga:** 2 mi. N of Nkondo–Kigindi Road, 0°50′N, 33°30′E, *Wood 805* (K). **Eastern:** Soroti Rock, 1°43′N, 33°38′E, *Lye 5379* (K). **Karamoja:** Lodoketeminit, near Moroto, 2°30′N, 34°36′E, *Kerfoot 1313* (K). **Northern:** N of Mengo, 2°N, 32°28′E, *Brown* 2185 (K). **Western:** Butiaba, Lake Albert, 1°50′N, 31°20′E, *Thomas 3458* (K). ZAMBIA. **Central:** Lunzua Valley, Kafakula, 15°32′S, 27°0′E, *Richards 4813* (K). **Luapula:** Mweru Lake, near Nchelengi, 8°45′S, 29°0′E, *Bullock 3826* (K). **Lusaka:** Mazabuka, 4 mi. from Chirunda on Lusaka Road, 15°58′S, 28°48′E, *Drummond 5503* (K). **Northern:** Abercorn, Cassawa Sands, 8°30′S, 31°17′E, *Richards 10921* (K). **Southern:** Livingstone, 17°45′S, 25°52′E, *Rogers 7023* (K). **Western:** Barotse Floodplains, Lizulu Island, 15°30′S, 23°30′E, *Verboom 1039* (K). ZIMBABWE. **Binga District:** Mwenda Research Station, *Grosvenor 144* (K). **Manicaland:** Umtali, Zimunya's Reserve, 18°50′S, 32°37′E, *Chase 6853* (K). **Mashonaland North:** 20 km from Makuti on road to Kariba, Urungwe National Park, 16°50′S, 28°0′E, *Philcox & Leppard 8718* (K). **Mashonaland South:** 311.5 km from Harare towards Chirundu, Zambezi Escarpment, 17°27′S, 30°19′E, *Philcox & Leppard 8575* (K). **Matabeleland North:** 30 km from Makuti on road to Kariba, 17°0′S, 28°0′E, *Philcox et al. 8748* (K). **Matabeleland South:** tributary of Nuanetsi River, near Mabalauta, Gona Game Reserve, 21°10′S, 30°15′E, *Ngoni 160* (K).

Host-specific strains of *S. gesnerioides* differ in succulence, number of branches, pubescence and color of stem, bract length relative to calyx, length of calyx lobes relative to tube, and corolla color, pubescence, and size. Seed size is fairly uniform, 0.30 × 0.20 mm, for all strains of *S. gesnerioides* except for the *Euphorbia*-strain, which measures 0.39 × 0.24 mm.

Strains of *Striga gesnerioides*

While *S. gesnerioides* has evolved a strong host-specificity among its populations, these "morphs" do not have enough morphological differences to justify according them the level of species or subspecies (Mohamed, 1994). However, because of the potential for damage to crops and as a reference for further molecular work, we consider it important to record information on the host strains.

***Euphorbia* (Euphorbiaceae) Strain:** Perennial, succulent, 12–25 cm tall, with 2 to 4 branches from base. Stem greenish yellow, drying brown, terete, thick, densely pilose with retrorse hairs. Internodes 1–3.5 cm long. All bracts similar, lanceolate, ciliate, incurved, shorter than calyx. Flowers opposite/subopposite in dense spikes, spike much longer than vegetative stem. Calyx 7–9 mm long, pubescent; lobes unequal, lanceolate, ciliate, ½ the tube length. Corolla light blue or dark purple, tube 10–12 mm long, sparsely hairy, bent and expanded distally above calyx; lobes of lower lip obovate, obtuse; upper lip indistinctly bilobed, wider than long. Parasitic on arborescent *Euphorbia* species, i.e., *E. abyssinica* J. F. Gmel. (Musselman & Hepper, 1986).

Selected specimens examined. ETHIOPIA. **Welo:** 1 km NE of Desse, near Borkenna River, 11°7′N, 39°38′E, *Sutherland 381* (MO). NAMIBIA. **Namaland:** Great Namaqualand, Great Karas Mountains, 25°10′S, 17°50′E, *Ortendahl 487* (UPS). SOUTH AFRICA. **Cape:** Bathurst, bank of Kareiga River, 32°15′S, 23°30′E, *Bayliss 5212* (GH). **Transvaal:** Albany, Douglas Heights, 26°12′S, 28°15′E, *Bayliss 3158* (GH). SUDAN. **Red Sea:** Gabal Mawinja, *Musselman 6180* (ODU).

***Indigofera* (Fabaceae) Strain:** Plant annual, succulent, up to 16 cm tall, with 2 to 4 branches from base. Stem light green or purple, drying black, slender, obtusely square, furrowed, covered with dense, soft, divergent hairs. Internodes short, not exceeding 1 cm. All bracts similar, ciliate, shorter than calyx. Flowers opposite/subopposite in open spikes, spike longer than the vegetative stem. Calyx 5–7 mm long, ribs hispid, translucent between ribs; lobes equal or subequal, linear to lanceolate, ciliate, about the same length as tube. Corolla light pink to deep purple, tube 7–10 mm long, sparsely hairy, bent proximally within calyx teeth; lobes of lower lip obovate, obtuse, longitudinally rolled inside when dry; upper lip emarginate, as long as wide.

Selected specimen examined. SUDAN. **Blue Nile:** Abu Naama, Gabal Obeid, 12°15′N, 33°28′E, *Mohamed* 10/25/88 (ODU).

***Tephrosia* (Fabaceae) Strain:** Plant annual, up to 23 cm tall, unbranched. Stem pale green, often red, drying brown, slender, obtusely square, furrowed, glabrate. Internodes 2.5 mm long. All bracts similar, lanceolate, ciliate, much shorter than calyx. Flowers opposite/subopposite forming somewhat open spikes, spike much longer than vegetative stem. Calyx 5–6.5 mm long, ribs hispid, translucent between ribs; lobes unequal, lanceolate, ciliate, < ½ tube length. Corolla pink to light purple, tube 8–10 mm long, sparsely pubescent, bent and expanded distally above calyx, lobes of lower lip linear-oval; upper lip emarginate, wider than long.

Selected specimens examined. BURKINA FASO. **Center East:** 5 km N of Tenkodogo, 11°50′N, 0°19′W, *Safa & Musselman* 10/9/87 (ODU). CAMEROON. **Northern:** 29 km S of Garoua, 9°5′N, 13°25′E, *Musselman et al.* 10/16/88 (ODU). NIGERIA. **Niger:** Mokwa, 9°18′N, 5°2′E, *Knepper* 9/19/89 (ODU).

***Vigna* (Fabaceae) Strain:** Plant annual, succulent, 8–26 cm tall, branched from base. Stem green or purple, drying black, slender, obtusely square, furrowed, covered with sparse, soft, divergent hairs. Internodes 1–3 cm long. Bracts lanceolate, ciliate, incurved, lower ones as long as or longer than calyx, upper ones shorter than calyx. Flowers opposite forming somewhat dense spikes, spike usually shorter than vegetative stem. Calyx 6–9 mm long, ribs hispid, translucent between ribs; lobes unequal, acuminate, ciliate, ½ tube length. Corolla light pink or bluish, tube 8–10 mm long, glabrate, bent and expanded distally above calyx, lobes of lower lip obovate, spreading, slightly rolled inside; upper lip emarginate, as long as wide. Economically, this is the most important strain of *S. gesnerioides* because it attacks *Vigna unguiculata* (L.) Walp., cowpea, which is a staple in parts of Africa. Damage can be extensive to this and a few other crops (Parker & Riches, 1993).

Selected specimens examined. BURKINA FASO. **Northern:** 5 km S Gourcy, 13°9′N, 2°22′W, *Safa & Musselman* 10/10/87 (ODU). MALI. **Koulikoro:** Bamako, Sotuba, 12°50′N, 8°0′W, *Musselman & Mohamed* 10/1/88 (ODU). NIGER. **Maradi:** Maradi, Weed Research Organization Station, 13°32′N, 7°5′E, *Parker 2264* (ODU). NIGERIA. **Kano:** near Kano Airport, 12°5′N, 8°35′E, *Knepper* 2/22/89, 8/24/89 (ODU).

***Ipomoea* (Convolvulaceae) Strain:** Plant annual, succulent, 15–30 cm tall, usually unbranched. Stem purple, drying black, obtusely square, furrowed, somewhat thick, scabrous, very sparsely pilose, with soft, divergent, short hairs. Internodes 1–4 cm long. All bracts similar, slightly incurved, shorter than calyx. Flowers opposite in open spikes, spike as long as or longer than vegetative stem. Calyx 5–7 mm long, ribs hispid, translucent between ribs; lobes unequal, acuminate, ciliate, shorter than tube. Corolla white to light blue, tube 9–13 mm long, glabrate, bent and expanded distally above calyx, lobes of lower lip spreading, linear-oval; upper lip emarginate, about as long as wide.

Selected specimens examined. MALI. **Koulikoro:** 14 km N Koulokani, 13°38′N, 7°54′W, *Musselman & Mohamed* 10/6/88 (ODU). SENEGAL. **Dakar:** 10 km N Dakar, *Musselman et al. 7066* (ODU). **Diourbel:** Kheur Serigne Sarr, 16 km E Diourbel, 14°39′N, 16°0′W, *Musselman 7064* (ODU). SUDAN. **South Kordofan:** Balangya, 10°30′N, 29°48′E, *Musselman* 8/23/86 (ODU).

***Jaquemontia* (Convolvulaceae) Strain:** Plant annual, succulent, up to 30 cm tall, unbranched or with 2–3 branches from base. Stem purple, drying black, slender, obtusely square, furrowed, sparsely to densely pilose with divergent hairs. Internodes 2–4 cm long. All bracts similar, incurved, ciliate, shorter than calyx. Flowers opposite in open spikes, spike very much longer than vegetative stem. Calyx 5–8 mm long, ribs hispid, translucent between ribs; lobes unequal, acuminate, < ½ tube length. Corolla pale blue or mauve, tube 8–11 cm long, glabrate, bent and expanded distally above calyx, lobes of lower lip obovate; upper lip widely obovate, indistinctly bilobed, wider than long.

Selected specimens examined. NIGER. **Dosso:** Kane, 224 km from Niamey on Maradi Road, 13°26′N, 3°53′E, *Parker 2312* (ODU). **Maradi:** Maradi, 13°32′N, 7°5′E, *Parker 2031* (K, ODU). NIGERIA. **Plateau:** Jos–Shendam Road, 9°50′N, 9°25′E, *Knepper* 8/26/89 (ODU). SOUTH AFRICA. *Musselman 6269* (ODU).

***Merremia* (Convolvulaceae) Strain:** Plant annual, succulent, up to 18 cm tall, unbranched or with 2–3 branches from base. Stem purple, drying black, slender, obtusely square, furrowed, sparsely to densely pilose, with divergent hairs. Internodes short, 2 cm long. All bracts similar, ciliate, incurved, shorter than calyx. Flowers imbricate forming dense spikes, spike very much longer than vegetative stem. Calyx 5–6 mm long, ribs hispid, translucent between ribs; lobes unequal, acuminate, about ½ tube length. Corolla purple, tube 8–10 mm long, glabrate, bent and expanded distally above calyx, lobes of lower lip linear-obovate, longitudinally rolled inside when dry; upper lip emarginate, wider than long.

Selected specimens examined. SUDAN. **Bahr-Al-Ghazal:** Djur River, *Aymlar* 27/51 (K). SUDAN. **Blue Nile:** Tozi, 12°54′N, 33°36′E, *Mohamed* 10/26/88 (ODU).

***Nicotiana* (Solanaceae) Strain:** Plant annual, 15–22 cm tall, unbranched. Stem pale green, drying brown, slender, obtusely square, furrowed, covered with dense, short, soft, divergent hairs. Internodes 1–3 cm long. Bracts ciliate, incurved, lower ones as long as or longer than calyx, upper ones shorter than calyx. Flowers sparse, opposite in open spikes, spike usually shorter than vegetative stem. Calyx 4–7 mm long, ribs hispid, translucent between ribs; lobes unequal, acuminate, about ½ tube length. Corolla pink/mauve, tube 8–10 mm long, with few hairs or glandular hairs, bent and expanded distally above calyx, lobes of lower lip obovate; upper lip emarginate, as long as wide. Tobacco in Zimbabwe has been seriously damaged by this strain (Wild, 1948).

Selected specimens examined. NIGER. **Maradi:** Maradi, near the Weed Research Organization Station, 13°32′N, 7°5′E, *Parker 1316, 2265* (ODU).

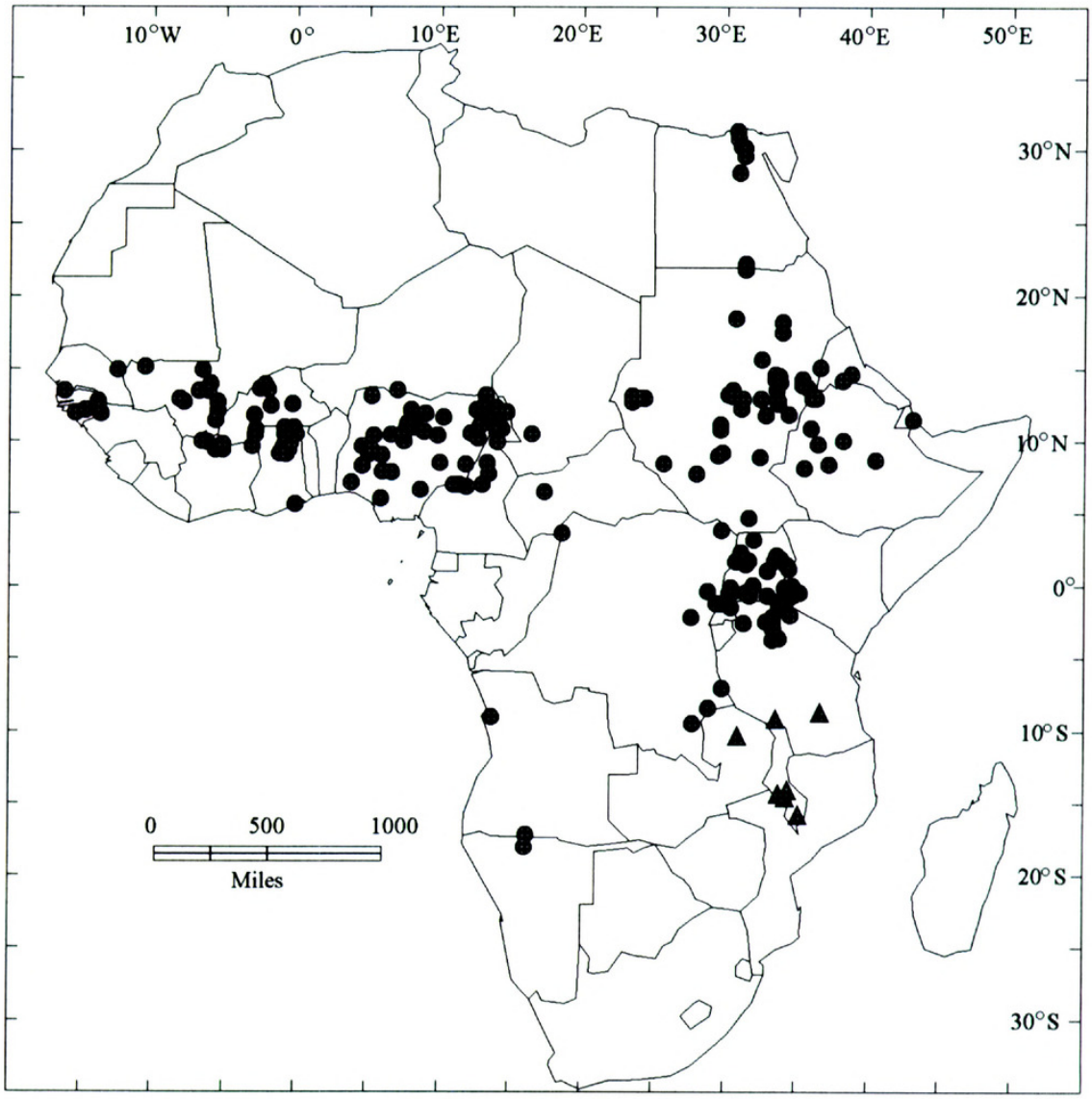

Figure 10. Distribution based on specimens of *Striga gracillima* (triangle) and *S. hermonthica* (circle).

14. Striga gracillima H. Melchior, in Mildbraed, Notizbl. Bot. Gart. Berlin-Dahlem 11: 681–682. 1932. TYPE: Nyassa Hochland. Station Kyimbila, *Stolz 1304* (holotype, B?; isotypes, BM!, K!).

Annual, 25–55 cm tall, slender, usually unbranched, densely scabrous, hispid, hairs ascending, stem obtusely square. Leaves 18–45 × 2–5 mm, opposite, narrowly elliptic, longer than internodes, margin entire, veins obscure. Lower bracts 10–25 × 2 mm, leaf-like, longer than calyx, upper bracts lanceolate, as long as or just shorter than calyx. Flowers alternate, shortly pedicellate, axillary at the base of inflorescence, becoming imbricate above middle, forming strobilus-like inflorescences, raceme shorter than vegetative stem. Calyx 5-ribbed, 5–7 mm long; tube 3–4(–5) mm long; lobes 5, unequal (adaxial reduced to < 1 mm), deltate, 1–2 mm long, shorter than tube. Corolla purple, tube 6–8 mm long, bent and expanded proximally within calyx teeth, densely hairy, never glandular-pubescent; lobes of lower lip 1–3 × 1–1.5 mm, spreading, obovate, upper lip 4 × 5 mm, obovate, emarginate, as long as wide.

Striga gracillima is a poorly understood species and has mistakenly been identified as *S. aspera* (Hepper, 1984). It has been collected from Malawi, Tanzania, and Zambia between 8°41′S and 15°45′S (Fig. 10). *Striga gracillima* differs from *S. hermonthica* in having a slender, sparsely branched stem; narrower, erect, linear-elliptic leaves; shorter corolla tube with smaller lobes; and much smaller calyces than those of *S. hermonthica*. The glandular pubescent corolla and the equal calyx lobes are among the features that distinguish *S. aspera* from *S. hermonthica* and *S. gracillima*. *Striga gracillima* has not been reported to attack crops. Its host range has not been investigated.

Selected specimens examined. MALAWI. **Central:** Dedza, Dedza Mountain Forest, 14°22′S, 34°20′E, *Salubeni 1330* (GH, K, MO); Dedza, near Kanjali, Chongoni Forest, 14°27′S, 34°18′E, *Salubeni 1341, 1539* (K); Lilongwe, 25 mi. S of Lilongwe, 14°17′S, 33°47′E, *Pawek 14332A* (K); Kyimbila, *Stolz 1304* (GH, MO); Nyassa Hochland, Station Kyimbila, *Stolz 1304* (BM, K). **Southern:** Chiradzulu, Chiradzulu Mountain, 15°45′S, 34°18′E, *Brummit & Banda 9838* (K). TANZANIA. **Morogoro:** Mahenge, 8°41′S, 36°41′E, *Schlieben 2108* (US). ZAMBIA. **Northern:** Kasama, 40 km W of Kasama, 10°16′S, 30°54′E, *Philcox et al. 10210* (K).

15. Striga hallaei A. Raynal, Bull. Jard. Bot. Belg. 39: 374. 1969. TYPE: Gabon. Efout, *Halle & Villiers 4914* (holotype, P!).

Annual, 30–60 cm tall, erect, slender, unbranched, pilose, stem obtusely square. Leaves 40–70 × 12(–30) mm, opposite, elliptic, shortly petiolate, coarsely toothed, 3-veined, shorter than internodes. Lower bracts 8–20 × 5 mm, leaf-like, upper ones reduced, all bracts longer than calyx. Flowers alternate in open racemes, raceme shorter than vegetative stem. Calyx 5-ribbed, 6–7 mm long; tube 2 mm long; lobes 5, equal, linear to lanceolate, 4–5 mm long, twice as long as tube. Corolla salmon-pink, tube 22–25 mm long, bent and expanded distally above calyx, densely pilose; lobes of lower lip 17 × 30 mm, broadly round; upper lip 12 × 15 mm, emarginate, reflexed backward.

This species inhabits openings within rainforests (Raynal-Roques, 1969) of Gabon and Democratic Republic of Congo (Fig. 7). The large toothed and nerved leaves, long calyx lobes, salmon-pink corollas, and adaptation to wet habitats suggest a relationship between this species, *S. forbesii*, and *S. latericea*. Of these three species, only *S. hallaei* has a 5-ribbed calyx.

16. Striga hermonthica (Del.) Benth., Companion Bot. Mag. 1: 365. 1836. *Buchnera hermonthica* Del., Fl. Egypte: 245, 34 fig. 3. 1813. TYPE: Egypt. *Delile s.n.* (holotype, P!).

Striga senegalensis Benth., in DC. Prodr. 10: 502 (1846). TYPE: Senegal. *Heudelot s.n.* (syntype, K!).

Annual, to 90 cm tall, stiffly erect, branched from middle, scabrous, densely hispid, hairs ascending, stem square, furrowed. Leaves 15–80 (–110) × (4–)10–25(–40) mm, opposite, linear or narrowly elliptic, ascending or spreading, longer than internodes, margin entire, veins obscure. Lower bracts 12–50(–95) × 2–5(–10) mm, leaf-like, longer than calyx, upper bracts lanceolate, as long as or shorter than calyx. Flowers opposite, forming a lax spike at base of inflorescence, becoming denser above middle, spike shorter than vegetative stem. Calyx 5-ribbed, 7–12 mm long; tube 5–10 mm long; lobes 5, unequal (adaxial reduced to < 1 mm), deltate, 2–4 mm long, shorter than tube. Corolla pink or mauve, rarely white, with ascending hairs, tube (13)16–20 mm long, bent and expanded proximally within calyx teeth, sparsely hairy, never glandular-pubescent; lobes of lower lip 7–15 × 3–6(–10) mm, obovate, upper lip 4–9 × 4–7 mm, emarginate.

Striga hermonthica, giant witchweed, is a serious pest of food crops (sorghum, maize, millet, rice) especially in the Sahel of Africa. In fact, in parts of the Sahel it causes more damage to millet and sorghum than any other factor, with the possible exception of birds. *Striga hermonthica* is not particular to soil type or pH and can be abundant on lighter soils in West Africa, as well as on heavy clay soils in East Africa.

Giant witchweed is an obligate outcrosser as is the related species, *S. aspera* (Musselman et al., 1991). Several insects are potential pollen vectors. Comparison of populations of *S. hermonthica* parasitizing similar hosts but growing in different geographical localities revealed a high level of morphological and floral variability. This high phenetic variability was accompanied by high genetic diversity (Bharathalakshmi et al., 1990; Olivier et al., 1998).

The sorghum- and millet-strains of *S. hermonthica* have similar vegetative characteristics but different corolla sizes and shades. The millet-strain has a smaller dull pink corolla and is common on sandy soil, whereas the sorghum-strain has a larger pink corolla and is associated with clay soils. Although host-specificity reduces the host range of the parasite, it may lead to successful attachment and better adaptability to a given host under specific conditions. Such floral differences could be expected to reduce cross pollination between the two strains when sympatric. Breeders developing grains for tolerance to the parasite need to be aware of genetic interchange in this wide-ranging species.

Striga hermonthica extends from Senegal to Ethiopia with southern limits in the Democratic Republic of Congo and Tanzania, between 22°3′N and 9°30′S (Fig. 10). There are a few collections from Angola and Namibia. Collections from the Nile Delta and parts of Yemen likely represent introductions with contaminated seed, a well-documented means of dispersal (Berner et al., 1992). *Striga hermonthica* has not been found in native grasslands except in the Nuba Mountains of the Sudan Republic (Musselman & Hepper, 1986).

South of 9°30′N, *S. hermonthica* is less frequent and smaller in size. *Striga hermonthica*, *S. asiatica*, and *S. gesnerioides* are the only species found north of the Sahara (Figs. 4, 8, 10).

In any large population of *S. hermonthica* it is possible to find albino plants. These are plants totally lacking chlorophyll yet capable of flowering because of their parasitic nature (Musselman & Hepper, 1986).

Selected specimens examined. ANGOLA. **Luanda:** Catete, 9°2′S, 13°42′E, *Gossweller 199, 14219* (K). BURKINA FASO. **Central:** 60 km E of Ouagadougou, 12°35′N, 0°18′W, *Safa & Musselman* 10/9/87 (ODU). **Northern:** Bogoya, 5 km NW of Ouahigouya, 13°38′N, 2°27′W, *Raynal 22263* (K). **Volta:** Boromo, 11°50′N, 2°55′W, *Raynal 22600* (K). CAMEROON. **Center South:** near Djikainke, 4 mi. from Foumban, 4°43′N, 10°55′E, *Leeuwenberg 10189* (K). **Northern:** Adamawa, near Gangumi, 7°0′N, 13°0′E, *Latilo & Daramola 28792* (K). CENTRAL AFRICAN REPUBLIC. **Ouham:** Bossango Region, 6°30′N, 17°20′E, *Fay & Doka 5070* (K). DEMOCRATIC REPUBLIC OF CONGO. **Equateur:** Libenge, 3°39′N, 18°38′E, *Lebrun 1759* (GH). **Haba:** Niabembe, 2°14′S, 27°44′E, *Steyagi s.n.* (US). **Haut Zaire:** between Mahagi and Mahagi Port, 2°16′N, 31°7′E, *Boutique 308* (K). **Kivu:** between Gabiro and Kidebe, 1°30′S, 30°25′E, *Lebrun 9631* (K). **Shaba:** Kundelungu, 9°30′S, 27°45′E, *Kassner exped. 2786* (K). DJIBOUTI. **Eastern:** Arta Road, 11°32′N, 43°9′E, *Curle 98* (K). EGYPT. **Cairo:** S of Al-Jizah, Helwan, 29°58′N, 31°16′E, *Boland 743* (K). **Delta:** Rodah, 30°15′N, 31°15′E, *Schweinfurth 1880* (US). **Red Sea:** Al-Fashn, 28°27′N, 30°55′E, *Faad 1881* (K), *Radjil 594* (GH). ERITREA. **Southern:** 4 km S of Adi Kuala, 14°38′N, 38°50′E, *Ryding et al. 1548* (K). **Teseney:** 15°6′N, 36°40′E, *Pichi-Sermolli 1295* (K). ETHIOPIA. **Gojam:** Shoa, 10°5′N, 38°16′E, *Meyer s.n.* (K). **Ilubabor:** Blue Nile, Gore, 8°9′N, 35°32′E, *Parker E22* (K). **Kefa:** Omo National Park, 8°25′N, 37°15′E, *Ash 3648* (K). **Ogaden Harerge:** at 8°44′N, 40°30′E, *Puff et al. 820922* (K). **Shewa:** N Addis Ababa, 9°12′N, 38°42′E, *Meyer 7594* (US). **Tigray:** Enda Sellassie, W of Axum, 14°10′N, 38°11′E, *Scott 217* (K). **Welega:** Gondor, 9°50′N, 36°31′E, *Massey 47* (K). GAMBIA. **Central:** Sapu, 13°0′N, 15°0′W, *Terry s.n.* (K), *Saunders 60, 62* (K), *Brookes 19* (K). GHANA. **Northern:** 2.3 mi. NW of Bunkpurugu, 10°32′N, 0°3′E, *Innes 30748* (K). **Upper:** Bongo, near Bolgatanga, 10°50′N, 0°50′W, *Hossain & Agyakwah 37855* (K). GUINEA BISSAU. **Central:** Bafata, Arredores Region, 12°12′N, 14°42′W, *Espirito Santo 2796* (K). **Eastern:** Gahee, Canquelifa, 12°40′N, 13°50′W, *Espirito Santo 2960* (K). IVORY COAST. **Bouna:** Varale, 60 km N of Bouna, 9°39′N, 3°6′W, *Geerling & Bokdam 934* (K). **Boundiali:** Zaguinaso, 64 km N of Boundiali, 10°2′N, 6°32′W, *Riches 249* (K). **Firkessedougou:** 5 km S of Firkessedougou, 9°36′N, 5°8′W, *Riches 226* (K). KENYA. **Nyanza:** 3 mi. S of Homa Bay, 0°34′S, 34°22′E, *Bogdan 4535* (K). MALI. **Kayes:** Dionkoulane Fields, Yelimane Circle, 15°8′N, 10°34′W, *Yeafes 88* (K). **Koulikoro:** Sekesona, 7 km from Ouelessebougou, 90 km S of Bamako, *Raynal 22194* (K). **Segou:** 7 km from Diabaly, 14°0′N, 6°0′W, *Raynal 22573* (K). **Sikasso:** 10 km W of Yangasso, *Raynal 22221* (K). NAMIBIA. **Cunene:** Oshikango, 17°9′S, 16°10′E, *Rodin 9379* (K). **Owambo:** Olukonda, 18°0′S, 16°3′E, *Reed 14* (K). NIGER. **Maradi:** 2 km W Maradi on Niamey Road, 13°32′N, 7°4′E, *Parker 2316, 2317* (ODU). **Niamey:** Niamey, Galome, 13°35′N, 2°10′W, *Hagerup 478* (K), *Barter 136, 1821* (GH). NIGERIA. **Bauchi:** 1 mi. N of Naraguta, 10°40′N, 8°55′E, *Hepper 1162* (K). **Bornu:** Biu, 10°35′N, 12°10′E, *Noble 30, 31* (K). **Gongola:** 10 mi. W of Gombi, 10°12′N, 12°41′E, *Lowe 1671* (K). **Kaduna:** between Zaria and Kano, site of new tollgate, 11°30′N, 8°10′E, *Lowe 4828* (K). **Kano:** Gaya, near Kano, 11°55′N, 9°2′E, *Shorland 179* (K). **Kwara:** Lokoja, 7°50′N, 6°40′E, *Parsons L79* (K). **Niger:** Kontajora, 10°25′N, 5°25′E, *Dalziel 171* (K). **Ogun:** Ibadan, Botany Department, 7°10′N, 3°50′E, *Lowe 2760* (K). **Plateau:** Jos-Shendam Road, 9°50′N, 9°25′E, *Knepper* 8/26/89 (ODU). **Sokoto:** Guadabawa, 13°8′N, 5°15′E, *Ryan 58* (K). SENEGAL. **Oriental:** Bakel, 14°55′N, 12°29′W, *Hepper 3721* (K). SUDAN. **Al-Jazirah:** Madani, Barakat, 14°20′N, 33°48′E, *Musselman 6139* (ODU, K). **Bahr Al-Ghazal:** Wau, 7°46′N, 28°2′E, *MacCintosh 103* (K). **Blue Nile:** Abu Naama, 12°49′N, 33°40′E, *Mohamed* 10/27/88 (ODU). **Kassala:** Al-Qadarif, 14°4′N, 35°24′E, *Schweinfurth 595* (K). **Khartoum:** at 15°38′N, 32°32′E, *Sawer 13698, 13699* (K). **North Darfur:** Gabal Kurdufan, 13°23′N, 23°32′E, *Wickens 628* (K). Gabal Abu Sinun, 12°52′N, 23°30′E, *Wickens 309* (K). **North Kurdufan:** El Obeid, Khartaget, 13°13′N, 30°32′E, *Musselman 6162* (ODU). **Northern:** Wadi Halfa, 1 km NW Debeira Station, 22°3′N, 31°23′E, *Petterson 16819* (K). **South Kurdufan:** near Kadugli, 11°1′N, 29°41′E, *Musselman 6155* (K). **Upper Nile:** Sobat, 8°55′N, 32°25′E, *Petherick 1863* (K). **West Kurdufan:** El Greo, *Pfund 679* (K). TANZANIA. **Mara:** Lake Province, Ikoma, Musoma, 2°2′S, 34°35′E, *Tanner 4142* (K). **Shinyanga:** near Shinyanga, 3°40′S, 33°27′E, *Box 293* (K). **Ziwa Magharibi:** West Lake Province, Biharamulo, 2°37′S, 31°19′E, *Tanner 5274* (K). CHAD. **Chari-Baguirmi:** Ba Ill, 10°32′N, 16°27′E, *Audry B2* (K). TOGO. **Northern:** 7 km N of Mango, 10°26′N, 0°17′E, *Pash 7916* (K). UGANDA. **Eastern:** Amuria, 2°4′N, 33°37′E, *Willemse 30* (K). **North Buganda:** Sempayo–Kiboga Road, Semlilci Flats, 0°40′N, 31°45′E, *Liebenberg 1029* (K). **Northern:** between Nimule and Gondokoro, along Bahr El Gabal, 3°10′N, 32°5′E, *Mearns 3005* (GH). **Southern:** W Ankole, 0°30′S, 30°18′E, *Dawe 444* (K). **Western:** Bunyoro, 1°38′N, 31°30′E, *Fyffe 32, 164* (K).

17. Striga hirsuta Benth., in DC. Prodr. 10: 502. 1846. TYPE: China. *Loureiro s.n.* (holotype, P!). Figure 2.

Striga pusilla Hochst, in DC. Prodr. 10: 503. 1846. TYPE: Ethiopia. Gafata, *Schimper 1209* (holotype, K!).

Annual, small, 2–6(–20) cm tall, slender, unbranched or branched from middle, sparsely hispid to ciliate, hairs ascending, stem obtusely square, furrowed. Leaves reduced, 3–15 × 0.5–1 mm, opposite/subopposite, linear, shorter than internodes, margin entire, veins obscure. Lower bracts 6–15 × 1 mm, narrowly lanceolate, longer than calyx, upper bracts lanceolate, shorter than calyx. Lower surface of leaves and bracts with a row of hispid hairs along margins and midrib, upper surface hispid only along margins. Flowers alternate in open racemes, raceme longer than vegetative stem. Calyx

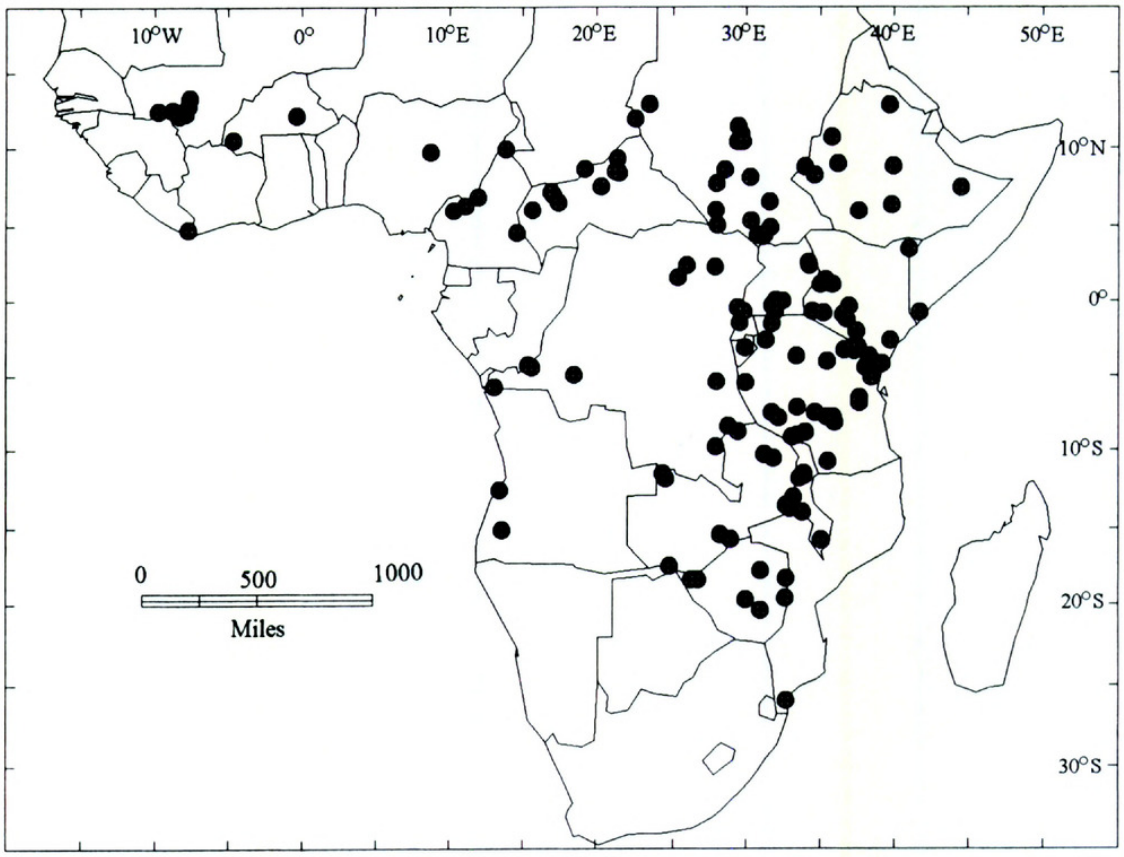

Figure 11. Distribution based on specimens of *Striga hirsuta* (circle).

10-ribbed, 4–5.5 mm long; tube 2–3 mm long; lobes 5, equal, subulate, 1.5–2.5 mm long, as long as tube. Corolla dark red with yellow throat, 8–10 (–12) mm long, bent and expanded distally above calyx, sparsely glandular-pubescent; lobes of lower lip 2–3(–5) × 1–2(–3) mm, obovate, upper lip 1–2 × 2–4 mm, emarginate.

Striga hirsuta is frequent in the Sudanian savanna. Its range extends from Mali to Ethiopia and south into Kenya, Tanzania, Malawi, and Mozambique between 13°N and 26°S (Fig. 11). *Striga hirsuta* and *S. lutea* may rarely attack crop plants such as sorghum and maize, but no noticeable damage occurs.

Striga hirsuta is typically a small plant, up to 6 cm, that emerges, flowers, and matures in a fairly short time. It flowers sooner after the commencement of the rains than the most damaging species, *S. hermonthica*. *Striga hirsuta* is less hispid than *S. asiatica* and *S. lutea*; however, it is more scabrous than both species. See comments under *S. asiatica*. Musselman and Hepper (1986) included *S. hirsuta* and *S. lutea* in *S. asiatica*. Further work is needed to elucidate the relationship of this species to *S. asiatica*.

Selected specimens examined. ANGOLA. **Benguella:** Benguella, 12°36′S, 13°20′E, *Gossweller 2916* (K). **Huila:** Couceiro, Vila Parire, 15°10′S, 13°30′E, *Henriques 853* (K). BURKINA FASO. **Eastern:** Fada-N'rGourma, 12°12′N, 0°25′E, *Safa & Musselman* 10/25/87 (ODU). BURUNDI. **Northern:** Bubanza, Imbo, 3°10′S, 29°58′E, *Reekmans 10314* (K). CAMEROON. **Eastern:** Batouri, 4°30′N, 14°30′E, *Taylor 1* (K). **North-Western:** Nanpe, 8 km W of Bangante, 8°5′N, 10°36′E, *de Wilde & de Wilde-Duyfjes 2397* (K). **Northern:** Jangla, foot of Vogel Peak, 8°22′N, 11°55′E, *Hepper 2745* (K). **Western:** Mbaw Plain, 6°15′N, 11°0′E, *Brunt 404* (K). CENTRAL AFRICAN REPUBLIC. **Bamingui-Bangoran:** 2 km E of Camp Koumbala, 8°29′N, 21°24′E, *Fay 2867* (K). **Nana-Mambere:** Bouar, 6°0′N, 15°35′E, *Mildraed 9501* (K). **Ouham-Pende:** near Nana-Bakassa River, 7°0′N, 17°0′E, *Fay 5068* (K). CONGO. **Kinshasa:** at 4°30′S, 15°30′E, *Woolhouse 51/61/22* (K). DEMOCRATIC REPUBLIC OF CONGO. **Bas-Zaire:** Boma, 5°48′S, 13°0′E, *Dacremont 128, 129* (K). **Haut Zaire:** Ibila-Bofea, 2°20′N, 26°0′E, *Eviard 2231* (K). **Katanga:** Kayuba, 9°45′S, 27°58′E, *de Witte 3332* (K). **Kivu:** Beni, 0°30′N, 29°28′E, *Gille 39* (K). **Shaba:** Pweto, 8°25′S, 28°51′E, *Robyn 1971* (K). ETHIOPIA. **Bale:** Dallo, 6°22′N, 39°50′E, *Mooney 8427* (K). **Gamo Gofa:** 8 km S of Arba Minch, 5°58′N, 37°36′E, *Gilbert et al. 320* (K). **Gojam:** Beles Farm, W of Gojam, 10°50′N, 35°47′E, *Parker 4074* (K). **Ilubabor:** Gambela, 8°18′N, 34°37′E, *Ash 518* (K). **Ogaden Harerge:** Awash National Park, 8°55′N, 39°55′E, *Gilbert 1663* (K). **Tigray:** Gafata, 12°55′N, 39°40′E, *Anonymous 1842* (GH, US). **Welega:** 9°3′N, 36°11′E, *Gilbert & Thulin 708* (K). KENYA. **Central:** Zawadi, 0°24′S, 36°59′E, *Faden et al. 74/572* (K). **Coast:** 30 km W of Buru, 3°45′S, 38°18′E, *Durham* 26/2/24 (K). **Eastern:** Emali Hill, 2°3′S, 37°27′E, *Someren 250* (K).

Nairobi: 1°17′S, 36°48′E, *Johnstone 1551* (K), *Red 1424* (K). **Rift Valley:** 2 km S of Lake Naivasha, 0°50′S, 36°14′E, *Gilbert 4840* (K). LIBERIA. **Maryland:** Harper, 4°25′N, 7°43′W, *Baldwin 5988* (US). MALAWI. **Central:** Fort Manning, Bua River, 13°47′S, 32°58′E, *Robson 1083* (K). **Northern:** 37 mi. SW Mzuzu, 11°47′S, 33°38′E, *Pawek 10942* (K). **Southern:** Blantyre, 2 mi. N of Limbe, 15°49′S, 35°7′E, *Brummit 8428* (K). MALI. **Koulikoro:** Baguineda, 22 km N of Bamako, 12°51′N, 7°46′W, *Musselman & Mohamed* 10/8/88 (ODU). MOZAMBIQUE. **Maputo:** Inhaca Island, 23 km E of Maputo (Lourenco Marques), 26°1′S, 32°57′E, *Mogg 30317* (K). NIGER. *Barter 530* (ODU). NIGERIA. **Plateau:** Jos-Plateau, 9°50′N, 8°40′E, *Knepper* 8/25/89 (ODU). RWANDA. **Kaduna:** Tegina, *Musselman & Mansfield 5531* (ODU). **Northern:** Ruhengeri, 1°30′S, 29°36′E, *Reekmans 4257* (K). SEYCHELLES ISLAND. Vallee de Mai, *Belle 196* (GH). SOMALIA. **Coast:** 5 km S of Goba, 0°47′N, 41°41′E, *Gillett et al. 5045* (K). SUDAN. **Bahr Al-Ghazal:** Djur River, 8°40′N, 28°35′E, *Ayhuer GA27151* (K). **Darfur:** Kalwe, *Hynes 478* (K). **Equatoria:** Nakbi, between Yambio and Tambio, 5°1′N, 28°5′E, *Myers 7000* (K). **Jungali:** near Baidit, 45 km N of Bor, 6°32′N, 31°36′E, *Lock 81/247* (K). **North Darfur:** Gabal marra, Kibbi, 12°1′N, 23°32′E, *Wickens 2241* (K). **South Kurdufan:** between Belatama and Kadugli, 11°30′N, 29°30′E, *Sherif 3952* (K). **Upper Nile:** Adok, 8°10′N, 30°18′E, *Petherick 1862* (K). TANZANIA. **Arusha:** Mbulu, Jebogo Hill, Mgati Plains, 4°5′S, 35°30′E, *Burtt 2105* (K). **Iringa:** 80 km N of Muhange, 8°10′S, 36°0′E, *Bidgood et al. 65* (K). **Kigoma:** Livingstone College, 5°30′S, 30°0′E, *Verdcourt 3390* (K). **Kilamanjaro:** Ngungu, Shimba Hills, 4°28′S, 38°4′E, *Jackson 415* (K). **Mafia:** Chungaruma, *Greenway 5371* (K). **Magharibi:** Biharamulo, on Nyamirembe Road, 2°39′S, 31°23′E, *Balslev 447* (MO). **Mbeya:** Chimala, 85 km E of Mbeya, 8°52′S, 34°0′E, *Bally & Carter 16448* (K). **Morogoro:** 25 mi. NE of Morogoro, 6°30′S, 37°40′E, *Bidgood et al. 429* (K). **Rukwa:** Tumba, 7°30′S, 31°45′E, *Bullock B14* (K). **Ruvuma:** 10 km SW of Songea, 10°44′S, 35°33′E, *Milne-Redhead & Taylor 882* (K). **Shinyanga:** near Shinyanga, 3°45′S, 33°27′E, *Box 291* (K). **Tanga:** Handeni, Nyongolo Hill, 5°27′S, 38°2′E, *Mgaza 434* (K). **Zanzibar:** *Kirk 2179* (K). **Ziwa Magharibi:** Muhutwe Bukoba, 1°35′S, 31°45′E, *Panayotis 98* (K). UGANDA. 2 mi. S of Akilok, *Langdale-Brown 2421* (K). **Central:** Entebbe, 0°4′N, 32°28′E, *Brown 21, 238* (K). **Karamoja:** SE of Karamoja, NE of Kocemaluk, 2°18′N, 34°18′E, *Hudson 296* (K). **Nile:** Koboko, 3°25′N, 31°0′E, *Looe P1048* (K). **North Buganda:** 10 km NW of Katera, 0°46′N, 31°58′E, *Lye s.n.* (K). **South Buganda:** Lake Kauonje, Mountain Masak, 0°21′S, 31°45′E, *Rose 10253* (K). **Southern:** Kambugo, Kisizi, 0°plain 45′S, 29°50′E, *Purseglove P2424* (K). ZAMBIA. **Eastern:** Fort Jameson, 13°37′S, 32°44′E, *Bush 23* (K). **Lusaka:** 1.5 km N of Marangora, Zambezi Escarpment, Urungwe National Park, 15°45′S, 29°0′E, *Philcox et al. 8563, 8610* (K). **North-Western:** Mwinilunga, near Matonchi, 11°41′S, 24°24′E, *Townsend 170* (K). **Northern:** 16 km E of Kasama, Nambkungu Ridge, 10°16′S, 31°15′E, *Philcox et al. 10190* (K). **Western:** Sesheke, 17°30′S, 24°50′E, *Gairdner 412* (K). ZIMBABWE. **Inyanga:** Inyanga, 18°15′S, 32°42′E, *Norlindh & Weimarck 4956* (K). **Manicaland:** River Tandai, 19°32′S, 32°40′E, *Myres 294* (K). **Mashonaland South:** Salisbury Experimental Station, 17°48′S, 31°1′E, *Wild 5718* (K). **Matabeleland North:** near Wankie Prison, 18°22′S, 26°30′E, *Raymond 319* (K). **Matabeleland South:** Selukwe, near Surprise Mine, 19°38′S, 30°0′E, *Cecil 128* (K). **Victoria:** Kyle National Park, 20°19′S, 31°1′E, *Philcox & Leppard 8870* (K).

18. Striga junodii Schinz., Mem. Herb. Boiss 10: 62. 1896–1900. TYPE: Mozambique. Delagoa Bay, *Junod 183* (holotype, G not seen).

Perennial, 30–60 cm tall, stiffly erect, unbranched, scabrous, hispid, stem winged. Leaves 10–25 × 1–2 mm, linear, opposite at base of stem, alternate above, shorter than internodes, margin entire, veins obscure. Lower and upper bracts similar, 2–5(–12) × 1 mm, linear, shorter than calyx. Flowers alternate in open racemes, raceme much shorter than vegetative stem. Calyx 15–18-ribbed, 11–15 mm long; tube 7–9 mm long; lobes 5, equal, linear to lanceolate, 4–7 mm long, slightly shorter than tube. Corolla purple, tube 20–22 mm long, bent and expanded distally above calyx, densely pubescent; lobes of lower lip 8–11 × 4–5 mm, spreading, obovate, slightly notched; upper lip 5–8 × 8–11 mm, emarginate.

Striga junodii is represented by only a few collections from swampy grounds in southern Mozambique and northeastern South Africa between 24°S and 26°S (Fig. 12). It does not extend north into Mozambique where the similar *S. pubiflora* occurs (Fig. 15). The two species may have different ecological requirements. *Striga junodii* is also morphologically similar to the Asian species, *S. masuria*; however, *S. junodii* has a characteristic notch on the lower corolla lobes. The current status of *S. junodii* remains unknown. We are unaware of extant populations. Collectors in Mozambique and South Africa should be aware of its presence.

Selected specimens examined. MOZAMBIQUE. **Inhambane:** Inhambane, 23°54′S, 35°30′E, *Anonymous 12092* (MO, S, UPS). **Maputo:** Lourenco Marques, Rikatla, 25°58′S, 32°32′E, *Junod 276* (BRE). SOUTH AFRICA. **Transvaal:** Muzi Swamp, 2 km from Phelendaba Crossing on Mbazwana Road, 23°55′S, 31°13′E, *Germishuizen 3534* (K); Nelspruit, 25°30′S, 30°59′E, *Prosser 1784* (BRE, K), *Britton 4778* (BRE).

19. Striga klingii (Engl.) Skan, Fl. Trop. Afr. 4(2): 413. 1906. *Buchnera klingii* Engl., Bot. Jahrb. 18: 69. 1893. TYPE: Togo. *Büttner 239/221* (B?).

Annual, to 86 cm tall, coarse, stiffly erect, often 3-branched just below inflorescence, scabrous, hispid, stem obtusely square. Leaves 20–40(–70) × 4–7(–12) mm, opposite, narrowly elliptic, tips obtuse, 3-veined, coarsely toothed, shorter than internodes. Lower bracts 10–20 × 2–4 mm, lanceolate, longer than calyx, upper bracts lanceolate, as long

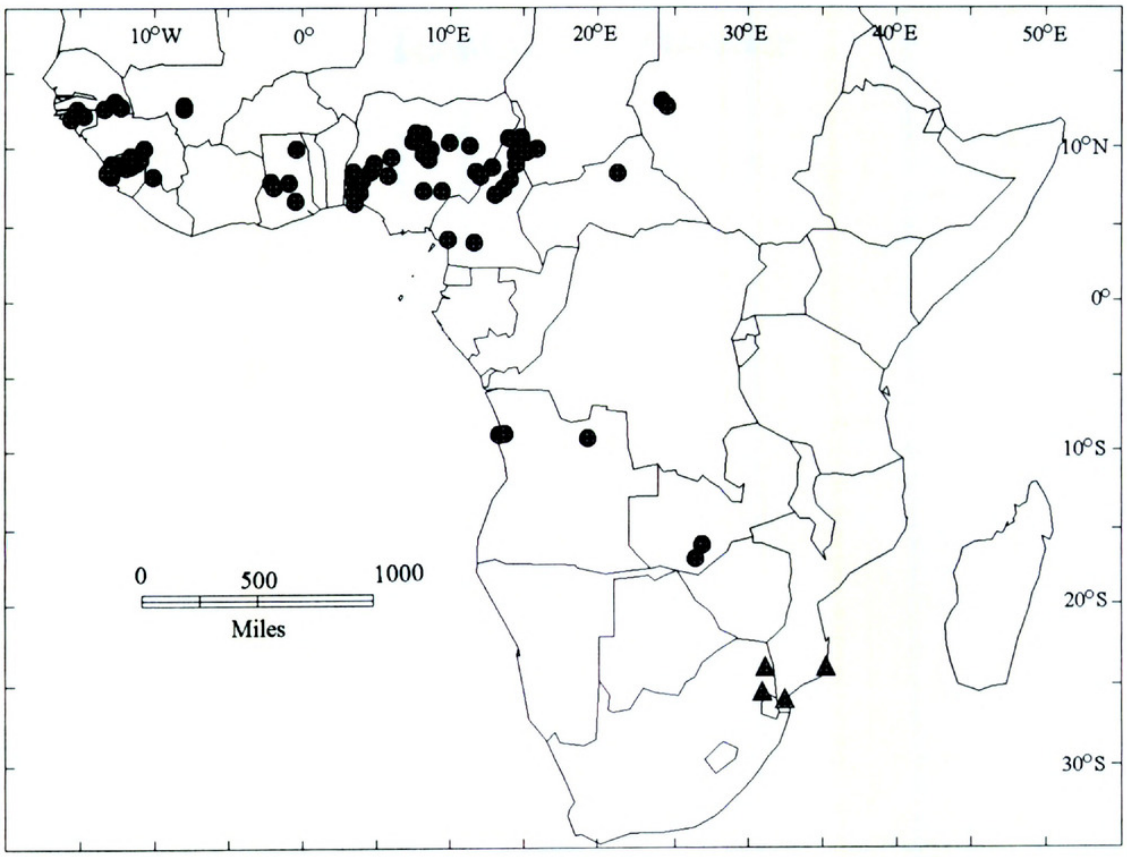

Figure 12. Distribution based on specimens of *Striga junodii* (triangle) and *S. macrantha* (circle).

as calyx. Flowers imbricate forming very compact spikes, spike much shorter than vegetative stem. Calyx 12–15-ribbed, 8–10 mm long; tube 5–6 mm long; lobes 4 equal or 5 unequal, linear, 3–5 mm long, slightly shorter than tube. Corolla pink, tube 10–13 mm long, bent and expanded proximally within calyx teeth, pubescent or glandular-pubescent; lobes of lower lip 4–7 × 2–4 mm, spreading, oval, upper lip 2–3 × 3–4 mm, obovate, emarginate.

A very distinct witchweed, stiffly erect with bright pink corollas, *S. klingii* is usually found in small populations parasitizing grasses in the wet savannas of west and central Africa. Its range extends from Senegal to southern Sudan between 4°0′N and 15°0′N with disjunct localities in Tanzania and Malawi (Fig. 13). *Striga klingii* is similar to *S. macrantha*; both species have three terminal branches just below the inflorescence. However, *S. klingii* has pink flowers whereas *S. macrantha* has white flowers and glandular hairs.

The vestiture of *S. klingii* is unique, as noted by Neumann et al. (1996) and Musselman (unpublished), with curved hairs that have very broad shield-like bases.

Selected specimens examined. CAMEROON. **Northern:** 10 km S of Ngaoundere, Adamaoua Plateau, 7°16′N, 13°35′E, *Breteler 258* (K); 7°20′N, 13°32′E, *Musselman et al. s.n.* (K); Ngaouyanga, 29 km N of Dogba, 7°20′N, 13°32′E, *Musselman* 10/16/88 (ODU). CENTRAL AFRICAN REPUBLIC. **Bamingui Bangoran:** Camp Koumbala, 8°29′N, 21°13′E, *Fay 6021* (K, MO). GHANA. **Brong Ahafo:** N of Krachi, 7°55′N, 0°1′W, *Morton 6292* (K). GUINEA. **Northern:** Youkounkoun, Sambailo, 12°40′N, 13°22′W, *Adam 13884* (MO). **Southern:** Mamou, 10°27′N, 12°2′W, *Shuell 6785* (K). GUINEA BISSAU. **Eastern:** Madina, 11°55′N, 14°5′W, *Espirito Santo 3754* (K). **Northern:** Bafata, Bambadinea, 12°12′N, 14°42′W, *Espirito Santo 3808* (K, MO); Farim, 12°35′N, 15°10′W, *Espirito Santo 3622* (K, MO); Piche, 12°25′N, 13°55′W, *Pereira 2328, 2368* (K); São Domingos, 12°30′N, 16°8′W, *Espirito Santo 3668* (K, MO). MALAWI. Kyimbila, N Lake Nyasa, *Stolz 2500* (GH). NIGER. *Barter 158* (GH). NIGERIA. **Gongola:** Vogel Peak Area, 8°22′N, 11°55′E, *Hepper 1397* (K). **Kaduna:** Zaria, Burra, 11°0′N, 9°0′E, *Harris 10* (K). **Niger:** near Mokwa, 9°18′N, 5°2′E, *Musselman & Mansfield 5533* (ODU). **North Nigeria:** *Lely 680* (K), *Roger 758* (K). SENEGAL. **Oriental:** Kedougou, 12°44′N, 12°15′W, *Adam 26881* (MO). SIERRA LEONE. **Eastern:** between Kainkordu and Sefadu, 8°34′N, 10°54′W, *Morton 2527* (K). **Northern:** Fiedwont, 8°45′N, 11°28′W, *Towa 8166* (K); Sekurela, Kabala, 9°33′N, 11°34′W, *Adam 21995* (GH, MO); Tingi Mountains, 8°56′N, 10°48′W, *Morton & Gledhill 3035* (K). SUDAN. **Equatoria:** Ibikes, 40 mi. NW of Yei, 4°17′N, 30°32′E, *Meyers 7867* (GH).

20. Striga latericea Vatke, Linnaea 43: 311. 1882. TYPE: Somalia. (?) *Anonymous s.n.* (holotype, K!).

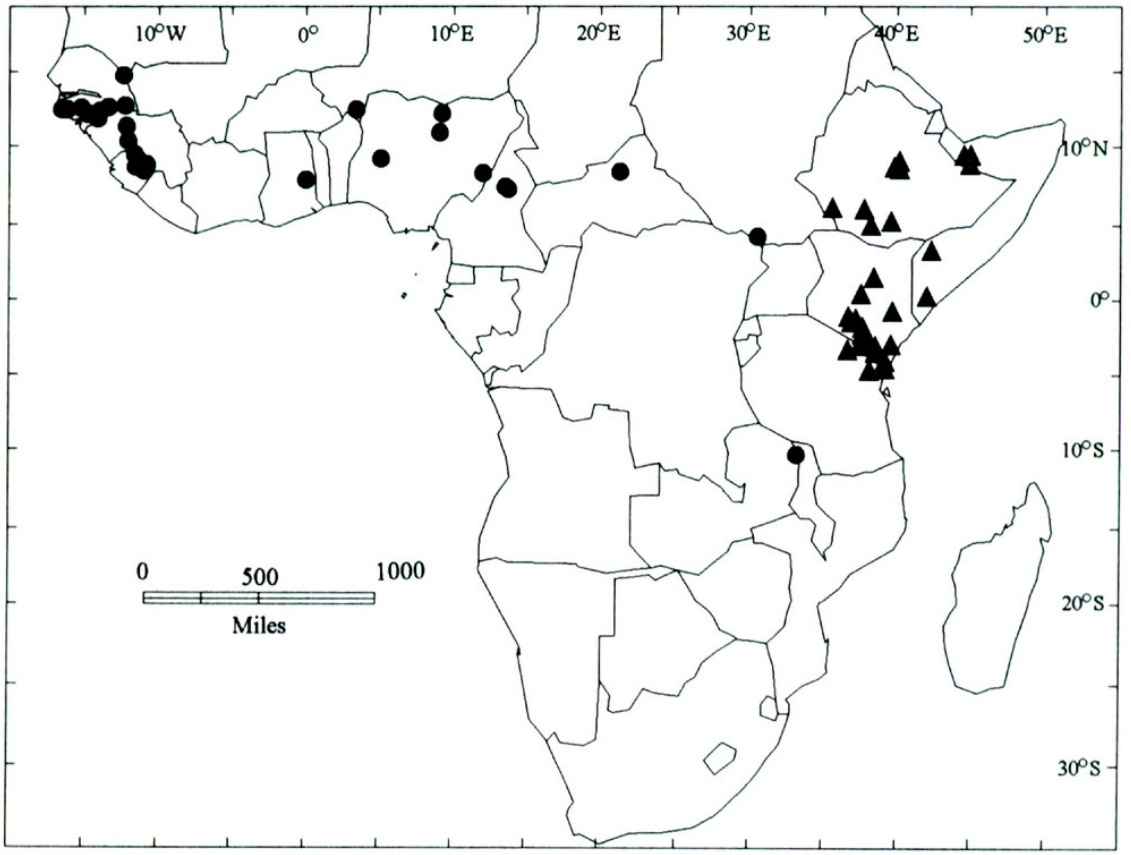

Figure 13. Distribution based on specimens of *Striga klingii* (circle) and *S. latericea* (triangle).

Rhamphicarpa stricta Engl., Abh. Preuss. Akad. Wiss. 24–39. 1894. TYPE: Tanzania. *Holst 2532* (holotype, K!).

Perennial, to 60 cm tall, stiffly erect, unbranched or with 2 to 3 branches from base, pubescent, stem square, furrowed. Leaves 20–35 × 4–6 mm, opposite, linear to lanceolate, 3-veined, shorter than internodes, margins slightly toothed. Lower bracts 20–33 × 2–6 mm, linear, often shorter than calyx, upper bracts lanceolate, shorter than calyx. Flowers opposite in racemes, raceme lax at its base, dense above middle, shorter than vegetative stem. Calyx at least 15-ribbed, 10–24 mm long; tube 10–15 mm long; lobes 5, unequal, broadly lanceolate, 5–15 mm long, longer than tube, lobes of lower calyces about 2 cm long, 3-veined. Corolla salmon-pink, tube 22–30 mm long, bent and expanded distally above calyx, densely glandular-pubescent; lobes of lower lip 10–15(–20) × 7–9 mm, obovate, upper lip 7–13 × 13–14 mm, emarginate.

Unlike *S. forbesii*, which is widely distributed in Africa, *S. latericea* (its closest putative relative) is confined to East Africa. It is found in swampy areas in Somalia, Ethiopia, Kenya, and Tanzania between 9°37′N and 4°40′S (Fig. 13) where it is sympatric with *S. forbesii*. We consider these two species distinct (also see comment under *S. forbesii*). Parker (1988) has shown that *S. latericea* is a perennial that produces aerial shoots from adventitious buds developing from the roots, unique in the genus (see also Raynal-Roques, 1993, for a discussion of roots in this species). The aerial parts also have a perennial habit with new shoots arising from the lower nodes after much of the stem matures and dies. *Striga latericea* is a pest of sugar cane in Somalia and Ethiopia (Parker & Riches, 1993).

Selected specimens examined. ETHIOPIA. **Kefa:** Maji, 6°8′N, 35°37′E, *Kaesssner 1474* (BM). **Ogaden Harerge:** Awash National Park, Metahara Plain, 8°59′N, 39°58′E, *Gilbert 1122* (K); Harar Sugar Estate, Awash Valley, 9°4′N, 40°9′E, *Parker 4034* (K, ODU). **Shewa:** Yerer and Kereya, 8°54′N, 39°59′E, *Puff et al. 8209* (K). **Sidamo:** 15 km NE Yavello, 4°59′N, 38°13′E, *Gilbert & Jefford 4594* (K); 20 km S of Negele, 5°15′N, 39°36′E, *Tadesse & Vollesen 3073* (K); Sidamo, 6°2′N, 37°46′E, *Putt & Kelbessa 921220* (K). KENYA. Between Samburu and Mackinnin, *Drummond & Homsley 4086* (K). **Coast:** between Makindu and Mtito Andei, 2°25′S, 37°57′E, *Hale 105* (K); Kilifi, near Ganze, 3°0′S, 39°35′E, *Robertson 4121* (K); Kwale, Kaya Bombo, 4°15′S, 39°10′E, *Luke 3489* (K); Mwatati-Voi, 3°10′S, 38°32′E, *Napier 957* (K); Mwatati-Voi, 3°25′S, 38°32′E, *Joanna 8928* (K); Saka–Garissa Road, 0°45′S, 39°40′E, *Faden & R.B. 74/744* (K); Vanga, Tanzania-Kenya border, 4°35′S, 39°12′E, *Smith* 10/92 (K); Diwanya Dakebuko, *Parker GM/522/H* (K). **Eastern:** Machakos, Sultan Hamud, Subalata, 2°0′S, 37°40′E, *Verdcourt 3690* (K); Mjiya Chumvi Isiolo, 0°24′N, 37°33′E, *Adamson 615* (K); Sultan Hamud, 2°8′S,

37°40′E, *Kaessner 645* (BM, K); Mwachi, 3 mi. S of Mazeras, *Drummond & Homsley 4247* (K); Mwea Irrigation Scheme, *Parker 2984* (ODU). **Nairobi:** Embakasi, near airport, 1°17′S, 36°48′E, *Napper & Faden 1839* (K); 20 km E of Nairobi, 1°17′S, 37°4′E, *Bogdan 3270A* (K); outside Nairobi at Mombasa Road, 1°19′S, 36°49′E, *Hensen 854* (K); near Magi Ghumor, *Kaessner 474* (K). **Northern:** *Jex-Blake 6880* (K). **Rift Valley:** Emali and Sultan Hamud, 2°50′S, 37°57′E, *Bally 8601* (K); Emali Station, 2°5′S, 37°27′E, *Bally 8176* (K); Majiya Chumki, 0°42′N, 37°33′E, *Adanson 615* (K, S). SOMALIA. Goan Libah, *Bally 10025* (K). **Jobba Hoose:** Juba Sugar Project, 0°15′N, 42°0′E, *Terry 3384* (K, ODU). **Woqooyi Gelbeed:** 80 km E of Hargesia, 9°37′N, 44°47′E, *Lavranos 7394* (K); Gombale Plains, 40 mi. E of Hargesia, 9°37′N, 44°38′E, *Glover & Gilliland 1231* (BM, K). TANZANIA. **Arusha:** Lekuruki Area, 3°20′S, 36°40′E, *Richards 24897, 26863* (K). **Kilimanjaro:** Mkomazi, 4°40′S, 38°7′E, *Harris 9* (K).

21. Striga lepidagathidis A. Raynal, Bull. Mus. Natl. Hist. Nat., B, Adansonia 224–225. 1987. TYPE: Guinea. Mamou, *Jacques-Felix 775* (holotype, P!).

Plant perennial, up to 12 cm tall, succulent, tufted, branched from base, glandular-pubescent, stem whitish or purple, square, furrowed. Leaves 8 × 2 mm, lanceolate, reduced, appressed, longer than internodes, margin entire, veins obscure. Bracts similar, 6 × 2 mm, lanceolate, slightly longer than calyx. Flowers imbricate in dense spikes, spike longer than vegetative stem. Calyx 5-ribbed, 6 mm long; tube 4 mm long; lobes 5, unequal, subulate, 1.5–2 mm long, about half tube length. Corolla purple, pink, or white, tube 10–12 mm long, bent and expanded proximally within calyx teeth, densely pubescent; lobes of lower lip 4–5 × 2 mm, spreading, lanceolate, longitudinally rolled in when dry, tips acute, upper lip 2–3 × 2–3 mm, emarginate, as long as wide.

Striga lepidagathidis grows in Senegal, Guinea, and Guinea Bissau (Raynal-Roques, 1987) between 13°N and 10°23′N (Fig. 8). It is parasitic on *Lepidagathis* (Acanthaceae) species and other dicotyledon plants (Raynal-Roques, 1987). *Striga lepidagathidis* resembles *S. gesnerioides* and *S. gastonii* in their overall features and is difficult to distinguish from them. (See comments under *S. gastonii.*)

Selected specimens examined. GUINEA. Touba-Kande, *Roberty 16608* (K). **Western:** Mamou (type), 10°23′N, 12°5′W, *Jacques-Felix 1241* (P). GUINEA BISSAU. **Eastern:** Boe-Madina, 11°45′N, 14°13′W, *Espirito Santo 3199* (K), *Pereira 2984* (K).

22. Striga lutea Lour., Fl. Cochinc: 22. 1790. TYPE: China. Canton, *Loureiro s.n.* (holotype, P!; holotype, K photo!).

Striga lutea var. *bicolor* Kuntze, Rev. Gen. Pl. 3, 2: 240. 1898. TYPE: Mozambique. *Kuntze 7494* (holotype, K!).

Annual, 7–40 cm tall, slender, unbranched or with 2- to 3-branches from middle, densely hispid, stem obtusely square. Leaves reduced, 3–7 × 1 mm, alternate, narrowly lanceolate, appressed, shorter than internodes, margin entire, veins obscure. All bracts similar, 1–4 × 0.5–1 mm, lanceolate, shorter than calyx. Lower surface of leaf and bract with two rows of hispid hairs along margins and midrib, upper surface hispid only along margins. Flowers sparse, alternate in lax racemes, raceme shorter than vegetative stem. Calyx 10-ribbed, 4–6 mm long; tube 3–4 mm long; lobes 5, equal, subulate, 1–2 mm long, about half tube length. Corolla yellow or rarely red, tube 10–11 mm long, bent and expanded distally above calyx, sparsely to densely glandular-pubescent; lobes of lower lip 2–3(–5) × 1–2 mm, obovate or oval, upper lip 1–2 × 2–3 mm, emarginate.

Striga lutea occurs between 15°N and 15°S (Fig. 14). The plants are easily overlooked in the field because they are small, possess a slender unbranched stem, and have reduced leaves. We do not know the relationship between this species and the Indian *S. lutea.* See notes under *S. asiatica* and *S. hirsuta.*

Selected specimens examined. BURKINA FASO. **Haut Bassins:** 5 km S of Banfora, 10°37′N, 4°43′W, *Safa & Musselman* 10/13/87 (ODU); Niangokolo Agronomic Research Station, 10°16′N, 4°54′W, *Safa & Musselman* 10/25/87 (ODU). CAMEROON. **Western:** Bangwa, 15 km NW of Bangante, 5°12′N, 10°36′E, *de Wilde & de Wilde-Duyfjes 2347* (K); Bawwda, Buru, 5°10′N, 10°30′E, *Howaiduud 1599* (K). CENTRAL AFRICAN REPUBLIC. **Ouaka:** 5 km E of Bambari, 5°41′N, 20°41′E, *Fay 1896B* (K). CONGO. **Haut-Mbomou:** Route Gwwane-Zemio, 4°55′N, 25°30′E, *Bousique 168* (K). DEMOCRATIC REPUBLIC OF CONGO. **Shaba:** Albertville, Lake Tanganyika, 5°56′S, 29°12′E, *Linder 1927* (GH). KENYA. **Coast:** Kwale, Shimba Hills, Giriama Point, 4°15′S, 39°10′E, *Magogo & Estes 1152, 1153* (K). **Eastern:** Embu, 0°32′S, 37°28′E, *Graham 2154* (K); Mahadra, *Graham 1701* (K). **Rift Valley:** Chyulu Hills, 2°32′S, 37°47′E, *Bally 8068* (K), *Gilbert* 6215 (K). MALI. **Koulikoro:** Dialakoro, 32 km S of Bamako, 12°20′N, 7°56′W, *Musselman & Mohamed* 10/4/88 (ODU); just N of Bamako, 12°40′N, 8°0′W, *Parker 4001* (ODU); Kamesoba, between Bamako-Siby, 12°30′N, 8°16′W, *Musselman & Mohamed* 10/2/88 (ODU); Zantiebougou, S of Baguineda, 12°45′N, 7°46′W, *Musselman & Mohamed* 10/5/88 (ODU). NIGERIA. **Niger:** Bida/Mokwa Junction, National Grain Corporation, 9°20′N, 5°40′E, *Parkinson* 9/18/85 (ODU), *Mansfield* 9/4/78 (ODU). SIERRA LEONE. **Northern:** near Mapaki, 9°40′N, 11°50′W, *Sighton 1298* (BM). **Western:** Waterloo, 8°25′N, 13°5′W, *Sighton 2042* (BM). TANZANIA. **Tanga:** Pombwe, Madanga, 4°50′S, 39°0′E, *Tanner 2954* (K). UGANDA. **Central:** Bugoye, 0°34′N, 33°45′E, *Dummer 2629* (US), *Curtis 4* (GH).

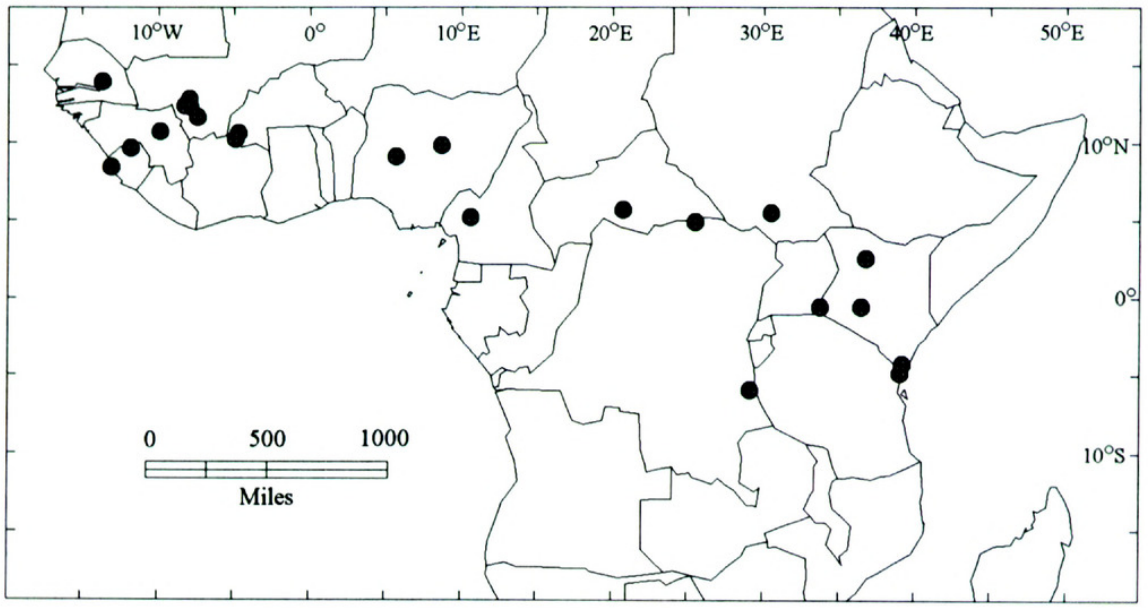

Figure 14. Distribution based on specimens of *Striga lutea* (circle).

23. Striga macrantha (Benth.) Benth., in DC. Prodr. 10: 503. 1846. *Buchnera macrantha* Benth., Companion Bot. Mag. 1: 366. 1836. TYPE: Sierra Leone. *Afzelius s.n.* (holotype, K!).

Buchnera buettneri Engl., Chev. Bot. 475. 1894. TYPE: Angola. *Welwitsch 5907* (holotype, K!).

Plant annual, up to 2.5 m tall, coarse, stiffly erect, often 3-branched just below inflorescence, covered with dense, hispid, glandular hairs, stem square, furrowed. Leaves 50–120(–160) × 4–15(–20) mm, opposite, narrowly elliptic, 3-veined, coarsely toothed, longer than internodes. All bracts similar, 10–20 × 2–5 mm, lanceolate, recurved, as long as or longer than calyx. Flowers imbricate forming very compact racemes, raceme much shorter than vegetative stem. Calyx 10-ribbed, 7–10 mm long; tube 4–7 mm long; lobes 5, unequal, lanceolate, 2–4 mm long, about half tube length. Corolla white, tube 17–24 mm long, bent and expanded distally above calyx, densely pubescent; lobes of lower lip 7–10 × 4–8 mm, obovate, spreading, upper lip 3–7 × 4–10 mm, emarginate.

One of the tallest of all witchweeds, *S. macrantha* is found in the grassland savannas in West and Central Africa between 13°55′N and 3°51′N (Fig. 12) and also from a few localities in Angola and Zambia. Its range overlaps with *S. klingii*, but *S. macrantha* has a more southerly distribution in West Africa (Figs. 12, 13). *Striga macrantha* has unique glandular trichomes composed of a 10–16-celled glandular head (Neumann et al., 1996). It resembles *S. klingii* and *S. angolensis*. See notes under *S. klingii*.

Selected specimens examined. ANGOLA. **Luanda:** Cazengo, 8°47′S, 13°15′E, *Gossweller 558* (BM). **Lunda North:** Luiballa, 9°10′S, 19°15′E, *Mouteiro 6143* (K). CAMEROON. **Center South:** Mountain Febem, 3 km NW Yaounde, 3°51′N, 11°35′E, *Breteler 2565* (K). **Littoral:** Douala to Mountain Bambouto, 4°2′N, 9°48′E, *Meurillon CNAD577* (K). **Northern:** 29 km N of Dogba at Ngaouyanga, 7°20′N, 13°32′E, *Musselman et al.* 10/16/88 (ODU). CENTRAL AFRICAN REPUBLIC. **Bamingui-Bangoran:** 8 km S of Koumbala, 8°26′N, 21°15′E, *Fay 4083* (K). GAMBIA. *Brookes 4* (K), *Lester 34* (K). GHANA. **Brong-Ahafo:** Techiman, 7°38′N, 1°58′W, *Adams & Akpabla 4509* (K). **Northern:** between River Oti and Atafie, 10°0′N, 0°25′E, *Morton 94* (K). **Volta:** Ho, 6°35′N, 0°30′E, *Glumptre 25* (K). GUINEA. **Northwest:** Youkounkoun, Sambailo, 12°40′N, 13°22′W, *Adam 13885* (MO). GUINEA BISSAU. **Central:** Bafata, Sallinho, 12°12′N, 14°42′W, *Espirito Santo 3636* (K). **Northern:** Farim, 12°35′N, 15°10′W, *Toul Botanica Exped. 1699* (K). **Western:** Tussubi, 12°0′N, 15°35′W, *Toul Botanical Exped. 1464* (K). LIBERIA. **Lofa:** Inpaka, near Kolahun Summit, 8°12′N, 10°4′W, *Bequaert 35* (GH). **Sinoe:** Greenville, 5°30′N, 8°50′W, *Adam 24394* (MO), *Adam 29806* (US). MALI. **Koulikoro:** Bamako, Manduingues, 12°40′N, 7°59′W, *Adam 11339* (MO). NIGER. *Parker 985* (GH). NIGERIA. **Bauchi:** Fuel Plantation, SE of Gombe, 10°12′N, 11°15′E, *Lowe 1484* (K). **Benue:** 2–3 mi. SE Oturkpo, 7°15′N, 8°10′E, *Anonymous 2143* (BM). **Gongola:** Adamawa, Dakemi, 8°25′N, 11°50′E, *Hepper 1392* (K). **Kaduna:** Zaria, near dam for Institution for Agriculture Research, 10°58′N, 7°58′E, *Gbile & Daramola 245* (K). **Kwara:** 10 km W of Isanlu-Makutu, 8°15′N, 5°45′E, *Lowe 4463* (K). **Lagos:** W of Lagos, 6°28′N, 3°30′E, *Rowland 1893* (K). **Niger:** 45 mi. N of Bida, 9°29′N, 5°58′E, *Harris 8* (K). **Northern:** *Dalziel 169, 911* (K). **Ogun:** Abeokuta, 7°6′N, 3°25′E, *Baldwin 13639* (K, MO, US). **Oyo:** Oyo, University of Ife Camp, 7°58′N, 4°0′E, *Suabad 6994* (MO). **Plateau:** Jos Plateau, 9°50′N, 8°40′E, *Batten-Poole 226* (K). **Southern:** southern Guinea Savana, *Musselman & Mansfield 5522* (ODU). SENEGAL. **Oriental:** Kedougou, 12°44′N, 12°15′W, *Adam 20029* (MO). SIERRA LEONE. **Freetown:** rifle range, near Waterloo,

8°22′N, 13°3′W, *F.A.M. & T.H. 474* (K). **Northern:** Bisawa, above Bumbuna, 9°6′N, 11°44′W, *King 175* (K). SUDAN. **North Darfur:** Ngertete, Gabal Marra, 12°50′N, 24°30′E, *Wickens 2807* (K). CHAD. **Logone-Oriental:** Lere to Ham, at 9°50′N, 14°40′E, *Talbot 324* (BM, K). ZAMBIA. **Southern:** Kalomo, 17°0′S, 26°30′E, *Fanshawe 4689* (K).

24. Striga passargei Engl., Bot. Jahrb. 23: 515, 12 figs. M, N. 1897. TYPE: Cameroon. Jola, *Passarge 48* (holotype, K!).

Annual, to 46 cm tall, erect, unbranched or branched from middle, densely hispid, stem obtusely square. Leaves 10–45 × 1–3 mm, narrowly elliptic, opposite/subopposite, ascending, longer than internodes, margin entire, veins obscure. Lower bracts 12–60 × 1–3 mm, linear, much longer than calyx, upper bracts as long as or longer than calyx. Flowers alternate in long, lax spikes, spike longer than vegetative stem. Calyx 5-ribbed, 8–12 mm long; tube 3–8 mm long; lobes 5, equal, linear to lanceolate, 3–8 mm long, about same length as tube. Corolla cream-white, rarely pink or yellow, tube 6–8 mm long, bent proximally within calyx teeth, glandular-pubescent; lobes of lower lip 2–6 × 2–4 mm, round, upper lip 1–3 × 2–5 mm, emarginate.

Striga passargei is found in the wet areas within the Sudanian domain in Africa. Its range extends from Senegal to Sudan between 14°44′N and 6°35′N (Fig. 15). In this area it is sympatric with *S. aspera* and *S. brachycalyx*. Unlike these two species, *S. passargei* always occurs in smaller populations. South of the equator, it occurs only in Tanzania, Zambia, and Namibia (Fig. 15). There is considerable variation in populations of *S. passargei* particularly in stem height, leaf and bract size, calyx lobes relative to tubes, and corolla color.

Selected specimens examined. BURKINA FASO. **Central:** Zorgo, 69 km E of Ouagadougou, 12°24′N, 0°35′W, *Raynal 22277* (K). **Center East:** 5 km S of Ouada, 11°30′N, 0°20′W, *Safa & Musselman* 10/9/87 (ODU). **Center North:** 55 km N of Ouagadougou, 12°51′N, 1°39′W, *Safa & Musselman* 10/19/87 (ODU). CAMEROON. **Northern:** Bogo, 35 km from Maroua, 10°44′N, 14°36′E, *Bounougou 126* (K). GHANA. **Brong-Afafo:** Bambo, 8°10′N, 2°12′W, *Hall 2028* (K). GUINEA **Northern:** Jiripa, 10°55′N, 1°58′W, *Thorold 251* (BM). **Central:** Pita, 11°6′N, 12°24′W, *Adames 341* (K). MALI. **Koulikoro:** Dialakoro, 32 km S of Bamako, 12°18′N, 7°56′W, *Musselman & Mohamed* 10/4/88 (ODU). NAMIBIA. **Ovamboland:** Ondangua, 17°56′S, 16°0′E, *Kers 1399* (S). NIGERIA. **Bauchi:** Panshanu Pass, 10°5′N, 9°3′E, *Lawlor & Hall 461* (K). **Bornu:** Lake Tchad Area, 13°5′N, 13°51′E, *Parkinson A1* (K). **Gongola:** Yola, 9°10′N, 12°25′E, *Dalziel 110* (K). **Kaduna:** Panshanu, 30 mi. from Jos on Jos–Bauchi Road, 10°8′N, 8°0′E, *Lawlor & Hall 73* (K). **Ogun:** Ibadan, IITA, 7°17′N, 3°30′E, *Parkinson 1985* (ODU). **Plateau:** Jos, Naraguta Hills, SE Naraguta, 9°50′N, 8°40′E, *Lawlor & Hall 34* (K). **Sokoto:** Sokoto, 13°8′N, 5°15′E, *Dalziel 355* (K). SENEGAL. **Oriental:** Dialakoto, 13°27′N, 13°18′W, *Musselman et al. 7061, 7063* (ODU). SUDAN. **Blue Nile:** Abu Naama, Gabal Tozi, 12°54′N, 33°36′E, *Lea 58* (K, ODU), *Lea 180* (K). **Jungali:** near Baidit, 45 km N of Bor, 6°35′N, 31°36′E, *Lock 81/248* (K). **North Darfur:** Kutum, 14°10′N, 24°42′E, *Lynes 578* (BM). **North Kurdufan:** Al-Obied, 13°15′N, 30°12′E, *Pfund 86* (K). **South Kurdufan:** Kadugli, Saref Research Station, 11°5′N, 29°42′E, *Musselman 198* (K). TANZANIA. **Eastern:** 2 mi. W of Chibembe River, Luangwa Valley Game Reserve, 14°25′S, 30°30′E, *Prince 200, 401* (K). **Lindi:** Kingupira Forest, 8°30′S, 38°34′E, *Vollesen 3311* (K, UPS). **Mwanza:** Mwanza, 2°30′S, 32°58′E, *Davis 255* (K). **Rukwa:** Tumba, Rukwa Valley, 4°15′S, 33°14′E, *Siame 144* (K). **Shinyanga:** near Shinyanga, 3°47′S, 33°27′E, *Rax 292* (K). **Tabora:** Rukwa-Nzega Plain, 4°10′S, 33°12′E, *Whellar 1188* (K). TOGO. **Northern:** Dapaon, (Dapango), 10°44′N, 0°12′E, *Hakki et al. 1504* (K). ZAMBIA. **Mashonaland North:** Kariba Airport, 16°30′S, 28°35′E, *Philcox & Leppard 8677* (K).

25. Striga pinnatifida Getachew Aweke, Kew Bull. 47: 293–294. 1992. TYPE: Ethiopia. Sidamo Prov., *Friis, Gilbert, Rasmussen & Vollesen 918* (holotype, K!; isotype, ETH not seen).

Annual, to 45 cm tall, erect, unbranched or with 2 to 3 branches from middle, covered with dense, hispid hairs, stem obtusely square. Leaves 15–30 × 10 mm, alternate, pinnatifid with linear segments, shorter than internodes. Lower bracts 10–25 × 8 mm, leaf-like, longer than calyx, upper bracts shorter than calyx. Flowers shortly pedicellate, alternate, axillary, solitary, sparse. Calyx 10-ribbed, 10–12 mm long; tube 6–7 mm long; lobes 5, unequal, lanceolate, 3–5 mm long, half tube length. Corolla white, tube 20 mm long, bent and expanded distally above calyx, pubescent; lobes of lower lip 6 × 5 mm, spreading, obovate, upper lip 3 × 6 mm, emarginate.

Striga pinnatifida is known solely from the type collection. It is the only witchweed with pinnatifid leaves and solitary flowers.

26. Striga primuloides Chev., Bull. Soc. Bot. Fr. Mem. 8: 185. 1912. TYPE: Ivory Coast. Anoumaba, *Chevalier B.22.404* (holotype, P!; isotype, K!).

Perennial, 30–70 cm tall, erect, unbranched, appearing leafless, pilose, stem obtusely square. Leaves scale-like, 2–5 × 1–2 mm, lanceolate, alternate, appressed, shorter than internodes, margin entire, veins obscure. All bracts similar, 4–7 × 1–2 mm, lanceolate, shorter than calyx. Flowers sparse, alternate in lax spikes, spike much shorter

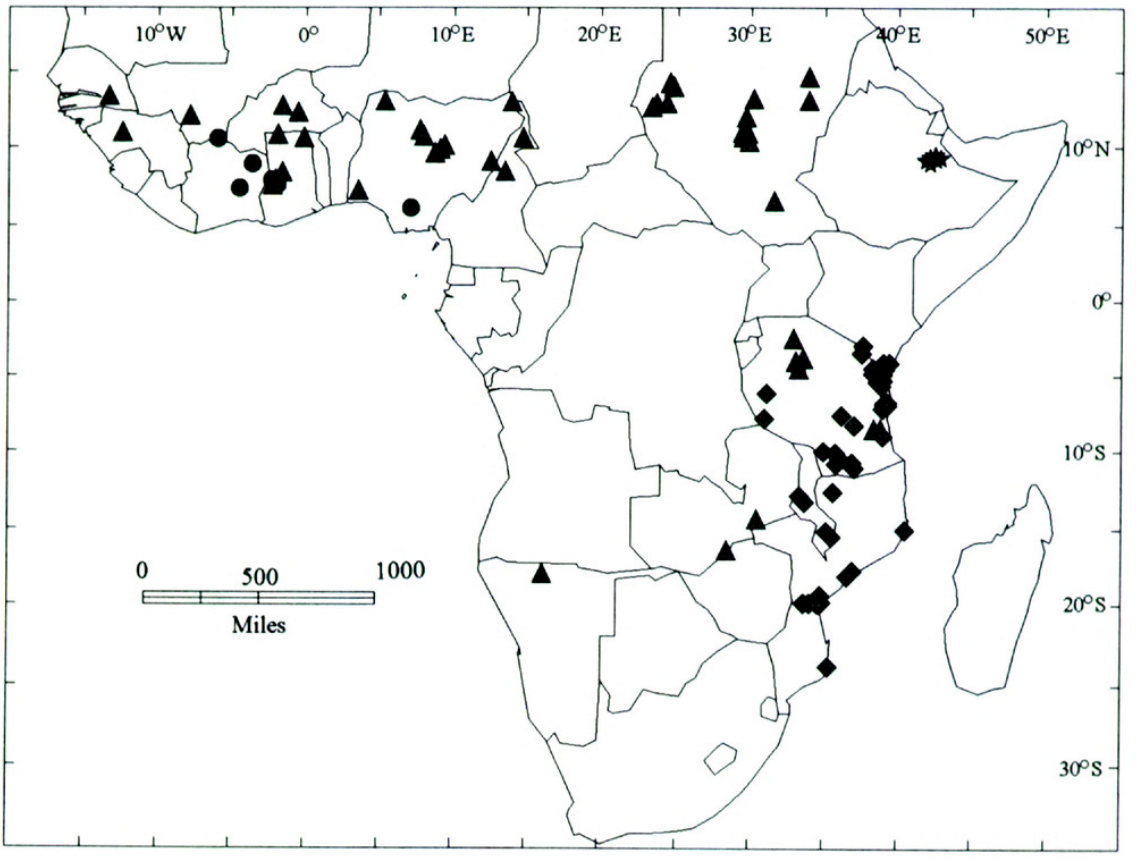

Figure 15. Distribution based on specimens of *Striga passargei* (triangle), *S. primuloides* (circle), *S. pubiflora* (diamond), and *S. yemenica* (star).

than vegetative stem. Calyx approximately 15-ribbed, 8–9 mm long; tube 5 mm long; lobes 5, unequal, lanceolate, 3–4 mm long, slightly shorter than tube. Corolla pale yellow, tube 22–30 mm long, bent and expanded distally above calyx, densely glandular-pubescent; lobes of lower lip 9–10 × 8–9 mm, round, spreading, as long as wide, upper lip 5 × 10 mm, broadly obovate, notched.

Striga primuloides is restricted to the southern parts of West Africa between 5°10′N and 10°37′N (Fig. 15). It is a rare species with only a few collections from Mali, Ivory Coast, Ghana, and southern Nigeria.

Selected specimens examined. GHANA. **Brong-Ahafo:** Bambo Ravine, 8°10′N, 2°8′W, *Hall 1998* (K), *Morton A4241* (K); Bambo, W of Wenchi, 8°15′N, 2°12′W, *Morton GC8601* (K). **Northeastern:** along road from Gawi to Seye, in Gallery Forest of Iringou River, 9°14′N, 3°41′W, *Amshoff 193* (MO). MALI. **Mopti:** Massina, Diou, 14°52′N, 5°16′W, *Laferrere 112* (K). NIGERIA. **South Nigeria:** Awkaka, *Birkett-Smith 49* (K).

27. Striga pubiflora Klotzsch., in Peters Reise Mossamb. Bot.: 227. 1861. TYPE: Mozambique. *Dayser s.n.* (holotype, B not seen).

Striga zanzibarensis Vatke, Linnaea 43: 310. 1882. TYPE: Mafia Isl. *Hildebrandt 1904* (holotype, K!).

Perennial, 35–75 cm tall, stiffly erect, unbranched or branched from base, densely pilose or hispid, stem obtusely square, furrowed. Leaves 10–20(–50) × 1–2(–4) mm, linear, opposite on the lower part of the stem, alternate above, shorter than internodes, margin entire, rarely toothed, veins obscure. Lower bracts 22–27 × 2 mm, linear, longer than calyx, upper bracts shorter than calyx. Flowers alternate in lax racemes, raceme shorter than vegetative stem. Calyx 15-ribbed, 13–21 mm long; tube 8–12 mm long; lobes 5, equal, lanceolate, 4–12 mm long, as long as or shorter than tube. Corolla white, tube 27–35 mm long, bent and expanded distally above calyx, densely pubescent; lobes of lower lip 14–20 × 10–17 mm, obovate, spreading, upper lip 9–12 × 10–20 mm, widely obovate.

Striga pubiflora is common in the seasonally flooded savannas of southeastern Africa between 3°10′S and 23°54′S (Fig. 15). Its range extends from Kenya south into Tanzania, Zanzibar, Malawi, and Mozambique. It may be related to *S. junodii* and *S. angustifolia* (Mohamed, 1994). *Striga pubiflora* and *S. angustifolia* are sympatric and also have white flowers, but the corolla of *S. pubiflora* is much larger.

Selected specimens examined. KENYA. **Coast:** Kwale,

Shimba Hills, Mombasa Road between Vanga and Tiwi turn-off, 4°25′S, 39°8′E, *Magogo & Glover 1050* (K). MALAWI. **Central:** Dowa, 25 km S of Kasungu, 13°14′S, 33°40′E, *Pawek 4112* (K). **Southern:** Zomba Mountain, Chivunde Valley Road, 15°20′S, 35°19′E, *Croix 2735* (MO). MOZAMBIQUE. 5 mi. NE of Lunga, *Moomaw 953* (K). **Inhambane:** Inhambane, 23°54′S, 35°30′E, *Anonymous s.n.* (BM). **Manica:** 25 mi. S of Muda, 19°51′S, 33°50′E, *Leach 11232* (K, MO). **Niassa:** 47 mi. W of Nova Ureixo on Mandimba Road, 12°40′S, 35°40′E, *Leach & Smith 11011* (K), *Allen 84* (K), *Stocks 55* (K). **Sofala:** 41 mi. N of Sofala, 19°50′S, 34°34′E, *Methew 257* (K). **Zambizia:** Quelimane, 17°53′S, 36°58′E, *Faulkner K118* (K). TANZANIA. **Dar es Salaam:** 20 mi. S of Dar es Salaam, between Mbwa and Kimbiji, 7°0′S, 39°18′E, *Batty 870* (K). **Iringa:** Mahenge Plateau, 7°37′S, 36°12′E, *Schlieben 2281* (K). **Lindi:** 3 km W of Nainokwe/Njinjio-Nangurukuru Road junction on road to Kilwa, 9°0′S, 39°0′E, *Magogo & Innes 373* (K). **Mafia:** Mji Mkuu, Kipumbwe, Mwera, *Tanner 2850* (K). **Morogoro:** 3 km N of Mlahi, 8°16′S, 37°5′E, *Kesollesen 2817* (K). **Pwani:** Kibaha, N of Bush, 6°46′S, 38°55′E, *Harris 786* (S). **Rukwa:** Mlimba, 7°51′S, 31°0′E, *Paget-Wilkes 700* (MO). **Ruvuma:** 5 km E of Gumbiro, 10°15′S, 35°48′E, *Milne-Redhead & Taylor 8421* (K). **Tanga:** Aboni, Mgaza 4°50′S, 39°0′E, *Tanner 89* (K). **Wani:** Kisarawe Mogo Forest Reserve, 7°3′S, 39°0′E, *Poulo 105* (K, MO). **Zanzibar:** Fessland bec Lamu, *Hildebrandt 1907* (UPS).

28. Striga yemenica Musselman & Hepper, Notes Roy. Bot. Gard. Edinburgh 45(1): 43–50. 1988. TYPE: Yemen Arab Republic. Jiblah, *Miller 546* (holotype, E!; isotype, K!).

Annual, 18–22 cm tall, erect, usually unbranched, covered with dense, retrorse, hispid hairs, stem square, furrowed. Leaves 10–22 × 1–2 mm, lanceolate, opposite, ascending, shorter than internodes, margin entire, veins obscure. Lower bracts 8–12 × 1(–2) mm, lanceolate, ciliate, longer than calyx, upper bracts shorter than calyx. Flowers opposite in lax spikes, spike as long as vegetative stem. Calyx 5-ribbed, 5–7 mm long; tube 4–5 mm long; lobes 5, unequal, (adaxial reduced to < 1 mm) deltate, 1(–2) mm long, much shorter than tube. Corolla red or mauve, bent distally above calyx, densely retrorsely pubescent; lobes of lower lip 0.5–1 × 2 mm, round, upper lip small, 0.5 × 2 mm, truncate.

In Africa, only in Ethiopia between 9°6′N, 9°38′N and 41°48′E, 42°49′E (Fig. 15). It bears some morphological similarities to *S. hermonthica* and *S. gracillima*. In these three species, the calyx lobes are short and deltate with the adaxial lobe reduced to less than 1 mm in length; corollas are pink or mauve with simple hairs and never glandular. *Striga yemenica*, on the other hand, has retrorse hairs in contrast to the antrorse hairs of *S. hermonthica* and *S. gracillima*.

Selected specimens examined. ETHIOPIA. 31 km from Alemaya on road to Grawa and Bedeno, *Gilbert 4072* (K). **Ogaden Harerge:** 4 km W of China Hasen, 31 km NW of Jijiga, 9°26′N, 42°42′E, *Boulos 10250* (K); Gures, 18 km NW of Jijiga, 9°20′N, 42°42′E, *Boulos 10509* (K); Harrar, 9°18′N, 42°8′E, *Ellis 272* (K); Mountain Hakim, 9°17′N, 42°6′E, *de Wilde 7223* (K); Mountain Hakim, 9°16′N, 42°7′E, *Gilbert & S.B. 1408* (K); 1 km W of Abu Yonis, 30 km NW Jijiga, 9°24′N, 42°45′E, *Boulos 10316* (K, MO).

Excluded Species

Striga baumannii has tuberous roots and a ligneous calyx, features not found in any other *Striga* species. The foliage is also unique with two large leaves formed during the growing season. In *Striga* the lowermost leaves are reduced to small scales. We consider *S. baumannii* distinct from any witchweed and therefore do not include it in the genus. It is thought to represent a new genus (Mohamed, unpublished).

Striga fulgens (= *Buchnera fulgens* Engl.) was named by Hepper (1984). However, Raynal-Roques (1993) presented evidence that it is a member of the Verbenaceae, likely in the genus *Chascanum* E. Mey. It has free lobes of the upper corolla lip as well as a glabrous calyx with characteristic white bands between the ribs and short calyx lobes (1–2 mm). Accordingly, we exclude it from *Striga*.

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List of Species

1. *Striga aequinoctialis* A. Chev. ex Hutch. & Dalz.
2. *Striga angolensis* Mohamed & Musselman
3. *Striga angustifolia* (Don) Saldanha
4. *Striga asiatica* (L.) Kuntze
5. *Striga aspera* (Willd.) Benth.
6. *Striga bilabiata* (Thunb.) Kuntze
   - 6a. *Striga bilabiatia* subsp. *barteri* (Engl.) Hepper
   - 6b. *Striga bilabiata* Kuntze subsp. *bilabiata*
   - 6c. *Striga bilabiata* subsp. *jaegeri* Hepper
   - 6d. *Striga bilabiata* subsp. *ledermannii* (Pilger) Hepper
   - 6e. *Striga bilabiata* subsp. *linearifolia* (Schum. & Thonn.) Mohamed
   - 6f. *Striga bilabiata* subsp. *rowlandii* (Engl.) Hepper
7. *Striga brachycalyx* Skan
8. *Striga chrysantha* A. Raynal
9. *Striga dalzielii* Hutch.
10. *Striga elegans* Benth.
11. *Striga forbesii* Benth.
12. *Striga gastonii* A. Raynal
13. *Striga gesnerioides* (Willd.) Vatke
14. *Striga gracillima* H. Melchior
15. *Striga hallaei* A. Raynal
16. *Striga hermonthica* (Del.) Benth.
17. *Striga hirsuta* Benth.
18. *Striga junodii* Schinz.
19. *Striga klingii* (Engl.) Skan
20. *Striga latericea* Vatke
21. *Striga lepidagathidis* A. Raynal
22. *Striga lutea* Lour.
23. *Striga macrantha* (Benth.) Benth.
24. *Striga passargei* Engl.
25. *Striga pinnatifida* Getachew Aweke
26. *Striga primuloides* Chev.
27. *Striga pubiflora* Klotzsch.
28. *Striga yemenica* Musselman & Hepper

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Specimens examined are listed alphabetically by collector; followed by collection numbers (or dates of collections for specimens with no numbers), herbarium, and the species number corresponding to the number in the List of Species.

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Gaepin 1709 (US) (11); Gairdner, A. E. 194 (K) (13), 412 (K) (17); Galpin, E. E. 9768 (K) (6b), 13131 (K) (6b); Gande, P. 39/74 (K) (11); Gardner, H. M. 3517 (K) (13); Gaughan, J. H. 1614 (K) (11); Gbesofssiere 3724 (GH, K) (16); Gbile et al. 63394 (K) (13), 64088 (K) (16), 72899 (K) (16); Gbile & B. O. Daramola 245 (K) (23); Geerling, C. & J. Bokdam 934 (K) (16), 2029 (MO) (6f); Geilinger 58 (K) (27), 499 (K) (27), 585 (K) (4), 2420 (K) (17), 4788 (K) (17) ; Germain, R. 4269 (K) (17), 5717 (K) (13), 6666 (K) (11), 6747 (K) (11); Germishuizen, G. 1018 (K) (6b), 3534 (K) (18); Gerrad, W. T. 424 (K) (11); Gerstner, J. 7151 (K) (4); Gilbert, J. B. 4253 (K) (13), 4347 (K) (13), 4722 (K) (13), 4723 (K) (13), 4918 (K) (13), 4938 (K)

(13), 13104 (K) (13), 17889 (K) (3); Gilbert, J. B. & F. Kariuki 18863 (K) (6e); Gilbert, J. B. & S. P. Kibuwa 19932 (K) (11); Gilbert, M. G. 1663 (K) (17), 2412 (K) (13), 4071 (K) (13), 4072 (K) (28), 4840 (K) (17), 6215 (K) (22), 6268 (K) (13); Gilbert, M. G. & A. Getachew 2958 (K) (13); Gilbert, M. G. & S. B. Gilbert 1078 (K) (13), 1250 (K) (6e), 1408 (K) (28), 1438 (K) (13); Gilbert, M. G. & T. G. Jefford 4594 (K) (20); Gilbert, M. G. & M. Thulin 415 (MO) (6e), 708 (K) (17); Gilbert, M. G. et al. 24 (K) (13), 304 (K) (13), 320 (K) (17), 345 (K) (13), 417 (K) (13), 524 (K) (13), 525 (K) (13); Gilbert, S. B. 1122 (K) (20); Gilger, W. 710 (K) (11); Gille 39 (K) (17); Gillespie, J. B. 186 (K) (4), 246 (K) (4); Gillett, J. B. 16369 (K) (16), 17889 (MO) (27); Gillett, J. B. & R. Faden 18152 (K) (13); Gillett, J. B. et al. 5045 (K) (17), 25031 (K) (13), 25136 (K) (13); Gilliland, H.B. k1398 (BM, K) (10); Gkvile, J. W. 41 (K) (4); Glanville, R. R. 241 (K) (6f); Gledhill, D. 285 (K) (6f), 328 (K) (23), 942 (K) (23); Glover, P. E. & H. B. Gilliand 1231 (BM, K) (20); Glover, P. E. & Samuel 2722 (K) (17); Glumptre, E. D. 25 (K) (23); Gooddny, H.V. 101 (K) (13); Goodies, R. 69 (K) (13); Gossweller, J. 199 (K) (16), 329 (K) (13), 558 (BM) (23), 647 (K) (13), 1466 (K) (4), 2234 (K) (6b), 2916 (K) (17), 3504 (K) (2), 3540 (K) (13), 4545 (K) (23), 14219 (K) (1); Goyder, D. J. & A. J. Paton 3515 (K) (11); Goyder, D. J. & A. R. Smith 3216 (K) (13); Goyder et al. 3631 (K) (17); Graham, M. A. 2405 (K) (6e); Graham, M. D. 3031 (K) (13); Graham, R. M. 272 (K) (4), 497 (K) (13), 1577 (K) (27), 1675 (K) (13), 1701 (K) (22), 2154 (K) (22); Grandraux, L. A. & F. Delemos 7913 (K) (11); Grant, A. L. 3141 (MO) (6b), 3505 (MO) (10), 3570 (MO) (6b), 2212387 (MO) (10); Greenstock, W. 1613834 (MO) (10); Greenway, P. J. 1204 (K) (4), 2274 (K) (17), 4358 (K) (13), 4462 (K) (6e), 5097 (K) (4), 5330 (K) (27), 5371 (K) (17), 7392 (K, US) (16), 7473 (K) (6e), 7840 (K, S) (10), 10519 (K) (4), s.n. (K) (13); Greenway, P. J. & J. M. Brenan 8095 (K) (6b), 8213 (K) (6b); Greenway, P. J. & Kanuri 11245 (K) (13), 11870 (K) (13), 14220 (K) (4); Greenway, P. J. & R. M. Polhill 11305 (K) (4), 11736 (K) (4); Greenway, P. J. & S. P. Rawlins 9463 (K) (11); Grosvenor, R. K. 144 (K) (13); Greenway, P. J. et al. 13160 (K) (13), 14082 (K) (13); Grosvenor, R. & J. Renz 1038 (K) (3); Guerra, J. A. 3812 (K) (11); Guile, D. P. 1662 (MO) (23).

Haarer, Q. E. 177 (K) (13), 338 (K) (17), 517 (K) (6e), 596 (K) (17), 637 (K) (10), 1767 (K) (17), 2307 (K) (11), 5127 (K) (13), 5128 (K) (13), s.n. (K) (17); Hagerup, O. 478 (K) (16); Hakki, et al. 289 (K) (6e), 309 (K) (6e), 1504 (K) (24), Hale, M. 105 (K) (20); Hall, J. B. 90 (K) (11), 131 (K) (6f), 260 (K) (6f), 400 (K) (16), 452 (K) (5), 558 (K) (11), 1392 (K) (6e), 1998 (K) (26), 2028 (K) (24), 2058 (K) (13), 3079 (K) (5), s.n. (K) (7); Hall, J. B. & B. O. Daramola 67404 (MO) (6e); Hall, J. B. & Swaine GC46220 (US) (24); Halle, N. & Villiers 4914 (P) (15); Hambler, D. J. 768 (K) (23); Hansen, O. J. 854 (K) (20), 3016 (K, MO) (6b), 3375 (K) (13); Hardy, D. S. 961 (K) (13); Hardy, D. S. & P. R. O. Bally 10826 (K) (13); Harison, 2 (K) (11); Harlan, H. V. 1029870 (US) (16); Harold, J. M. 903 (K) (10); Harrer, A. E. 2227 (K) (6a); Harris, B. J. 1774 (K) (13), 2523 (K) (11); Harris, B. J. & A. McCusker BJH2568 (MO) (27); Harris, E. 4 (K) (7), 5 (K) (16), 6 (K) (23), 7 (K) (7), 8 (K) (23), 9 (K) (16), 10 (K) (19), 11 (K) (6f); Harris, L. D. 9 (K) (20); Harris, T. M. 195 (K) (7), 786 (S) (27); Hayes, T. R. 539 (K) (6f); Haygarth, W. 92714 (MO) (10); Hazel, C. 289 (K) (16); Hazel, G. 442 (K) (11); Hazel, O. 521 (K) (17); Hedbert, O. 7022 (UPS) (4); Hemming, C. F. & R. M. Watson 30216 (K) (13); Henriques, C. 853 (K) (17); Hepper, F. N. 1162 (K) (16), 1218 (K) (16), 1278 (K) (16), 1392 (K) (23), 1397 (K) (19), 1847 (K) (16), 2745 (K) (17), 3721 (K) (16), 3759 (K) (16), 3915 (K) (23), 7333 (K) (3), 7368 (K) (3), 7373 (K) (4), 7377 (K) (13); Hepper, F. N. & D. V. Field 5218 (K) (4); Hepper, F. N. & A. Jaeger 6618 (K, MO) (10); Hepper, F. N. & J. K. Morton 2314 (K) (6e), A3039 (K) (6f), A3050 (K) (6e), A3110 (K) (6f), A3160 (K) (16); Hettewy, A. W. 52 (K) (13), 179 (K) (13), 186 (K) (13); Hildebrandt, J. M. 1907 (UPS) (27); Hill, A. W. 51 (K) (6f); Hill, B. 755 (K) (6a); Hilliard, O. M. & B. L. Burtt 7861 (MO) (10), 10012 (MO) (6b), 12139 (K) (10); Hindort 818 (K) (16); Holub, E. 1834 (K) (10), 1883 (K) (11), 1993 (K) (13); Hooper, S. S. & C. C. Townsend 503 (K) (6b); Hopkins, J. C. 9712 (K) (11), 14555 (K) (13); Hornby, R. M. 2898 (K) (11); Hossain, & Agyakwah 37826 (K) (5), 37829 (K, S) (5), 37831 (K) (13), 37954 (K) (16), 37855 (K) (16), 37957 (K, US) (16), s.n. (K) (5); Howaiduud 1599 (K) (22); Hudson, D. 64 (K) (17), 296 (K) (17), 2566 (K) (17); Hughes, N. K. s.n. (ODU) (10); Huntley, B. J. 192 (MO) (6b); 2033 (MO) (10); Hutchinson, J. 2381 (K) (6b), 2586 (K) (6b), 2854 (K) (10); Hutchinson, J. & J. B. Gilbert 3537 (K) (3); Hynes, A. 478 (K) (17), 576 (K) (16).

Innes, R. R. 373 (K) (27), 909 (K) (6f), 30116 (K) (16), 30748 (K) (16); Irvine, R. 146 (K) (6e), 466 (K) (6e), 1426 (K) (6e), 1620 (K) (6e), 4534 (K) (16), 4572 (K) (13), 4574 (K) (13), 4581 (K) (16), 4667 (K) (5), 4668 (K) (7), 4669 (K) (7), 4732 (K) (7), 4914 (K) (5), 4915 (K) (6e), s.n. (K) (6e); Ithwa, R. 1370 (US) (16); Iverson, et al. 87612 (K) (13).

Jackson, G. 649 (K) (6b), 1656 (K) (4), 2282 (K) (3), U103 (K) (17); Jackson, J. A. D. 119 (K) (16), 254 (K) (11); Jackson, J. K. 2722 (K) (13), 3196 (K) (17); Jackson, W. B. 415 (K) (17); Jacques-Felix, 1241 (P) (21); Jaeger, H. D. 1225 (K) (11); Jaeger, P. 753/51 (K) (6c), 790 (K) (23), 2541 (K) (6c); Jahandiez, E. 149 (BM) (13), 202 (BM) (13); James, E. 1905 (K) (11), 1905 (K) (16), 1905 (K) (17); Jansen, P. C. 8040 (K) (13); Jarrett, T. 103 (K) (6e); Jasen, P. C. 8158 (K) (4); Jeagu, A. J. 84 (K) (4); Jeffery, G. M. K242 (K) (4); Jefford, et al. 53 (K) (13); Jex-Blake, M. 6880 (K) (20); Joanna, B. 8928 (K) (20), 8947 (K) (13); Jocobsz, M. L. 218 (K) (10), 2011 (K) (6b); Johannes, 26–1–22 (US) (10); Johnson, W. P. 32 (K) (13), 101 (K) (4); Johnston, A. H. 83 (K) (11); Johnstone, M. 1551 (K) (17); Jones, A. 3660 (K) (16), 7164 (BM) (23); Jones, K. W. 41 (K) (4), 501 (K) (16), 502 (K) (16), 503 (K) (16), 504 (K) (16), 505 (K) (16), 506 (K) (16), 512 (K) (16), 513 (K) (16), 514 (K) (16), 515 (K) (16), 516 (K) (16), 517 (K) (16), 518 (K) (16), 519 (K) (16), 521 (K) (16), 522 (K) (16), 523 (K) (16), 524 (K) (16), 525 (K) (16), 526 (K) (16), 527 (K) (16), 528 (K) (16), 529 (K) (16), 530 (K) (16), 531 (K) (16), 532 (K) (16), 533 (K) (16), 534 (K) (16), 535 (K) (16); Jones, V. 3 (K) (11); Jordan, H. D. 152 (K) (23), 190 (K) (6f); Junod, H. A. 276 (BRE) (18).

Kaessner, T. 474 (K) (20), 645 (BM, K) (20), 1474 (BM) (20); Kassner Exped., 190 (K) (17), 2397 (K) (6b), 2786 (K) (16), 3148 (K) (16); Keay, R. W. J. 21674 (K) (16), 25446 (K) (13), 25833 (K) (6f), 25896 (K) (6e), 25977 (K) (24), s.n. (K) (6f); Kelly, R. D. 80 (K) (10); Kemp, S. 701 (MO, US) (6b); Kennedy, J. D. 2894 (K) (16); Kenyon, E. 1901 (K) (13); Kerfoot, O. 1313 (K) (13), 3815 (K) (13); Keritochonorag, H. 2166 (K) (16); Kers, L. E. 1399 (S) (24); Kersting, 665 (K) (7); Kesollesen, 2817 (K) (27); Kew, J. 19911 (MO) (27); Kilian, N. 1833 (K) (13); Killick, D. J. 3857 (K) (6b); Killick, H. J. 234 (K) (11); Killick & Leisner 3415 (K) (11); Kimani, Z. J. 186 (K) (13); King, A. E. 260 (K) (11); King, E. L. 175 (K) (23),

175B (K) (23); Kirk, J. 15/1/63 (K) (11), 2179 (K) (17), 9/68 (K) (4), 1 (K) (13); Knepper, D. K. 8/22/89 (ODU) (13h), 8/24/89 (ODU) (13h), 8/25/89 (ODU) (17), 8/26/89 (ODU) (13d), 8/26/89 (ODU) (16), 8/26/89 (ODU) (5), 8/25/89 (ODU) (5), 9/20/89 (ODU) (16), 9/22/89 (ODU) (16), 9/23/89 (ODU) (16), 9/23/89 (ODU) (5), 9/24/89 (ODU) (16), 9/26/89 (ODU) (5), 9/19/89 (ODU) (13g), 9/21/89 (ODU) (5), 9/23/89 (ODU) (5); Konging, J. de & D. Zunguze 8038 (K) (6b); Korans, J. 1508 (K) (10), 1596 (K) (13), 3060 (K) (6b), 3299 (K) (6b), 3364 (K) (13); Krauss, J. 213 (MO) (6b); Koritschoner, H. 2059 (K) (11); Kuchar, P. 15312 (K) (13); Kuntze, O. 7/iv94 (US) (4), 94 (K) (13), 1913 (K) (4).

La Croiz, I. F. 2735 (MO) (3); Laferrere, M. 112 (K) (26); Lamb, P. H. 4 (K) (16); Lambrecht, D. 479 (K) (11); Lambrecht, F. L. 31 (K) (13), 264 (K) (6b), 440 (K) (6b); Lamprey, H. F. 515 (K) (6e); Lanbrester, C. H. 18 (K) (6a); Langdale-Brown, I. 2392 (K) (16), 2421 (K) (17); Last, J. T. 1887 (K, US) (4), 1908 (K) (17); Latilo, M. G. 18214 (K) (16); Latilo, M. G. & B. O. Daramola 28792 (K) (16); Lavranos, J. J. 4265 (MO) (10), 7394 (K) (20); Lavranos, J. J. & Cater 23192 (K) (13); Lavranos, J. et al. 24938 (K) (13); Lawlor, D. W. & B. J. Hall 28 (K) (11), 34 (K) (24), 73 (K) (24), 461 (K) (24), 468 (K) (13), 508 (K) (7), 46508 (K) (5); Lawrence, E. 15 (K) (4), 28 (K) (4), 163 (K) (4); Lea, A. LR20 (K) (11); Lea, J. D. 10 (K) (27), 17 (K) (16), 58 (K, ODU) (24), 180 (K) (24); Leach, L. C. 9189 (K) (27), 11232 (K, MO) (27); Leach, L. C. & R. F. Smith 11011 (K) (27); Lean, O. B. 37 (K) (11); Lebrun, J. 1759 (GH) (16), 3374 (GH, K) (16), 3535 (MO) (13), 3557 (GH) (11), 9631 (K) (16); Lecard, F. s.n. (K) (16); Ledermann, C. 4529 (BM) (6d); Lee, J. l6 (K) (11); Leeuwenberg, A. J. 4357 (K, MO) (6f), 10189 (K) (16); Leighton, J. M. 2948 (MO) (6b); Leistner, O. A. 1817 (K) (13); Lelehase, N. 3673 (MO) (10), 3764 (MO) (10); Lely, H.V. 146 (K) (6e), 255 (K) (11), 489 (K) (13), 535 (K) (13), 590 (K) (16), 680 (K) (19), P83 (K, MO) (6f), P369 (K) (11), P567 (K) (7), P785 (K, MO) (23); Lester, J. B. 34 (K) (23); Lester, R. N. & M. Morrison, 2337 (K) (6a); Letouzey, R. 624 (K) (6f), 6299 (K) (11), 6406 (K) (16), 7209 (K) (16); Levy, B. 1177 (K) (13); Lewalle, H. J. 335 (K) (11), 1474 (K) (13), 2402 (K) (17), 10634 (BM) (13); Liben, L. 976 (K) (13), 2038 (K) (11), 2401 (K) (4), 3705 (K) (11); Liebenberg, L. C. C. 1029 (K) (16), 1532 (K) (11), 4942 (K) (13), 6904 (K) (6b), 6986 (K) (10), 8581 (MO) (10), 8748 (MO) (10), A516 (K) (13); Lind, E. 340 (K) (6a), 387 (K) (16), 2027 (K) (6a); Linder, D. H. 1927 (GH) (22), 1966 (K) (13); Linoblom, K. G. 1911 (S) (10); Lisowski 80551 (BR) (6c), 80579 (BR) (6c); Lloyd, H. 80 (K) (10); Lobin, W. 6687 (K) (13); Lock, J. M. 81/77 (K) (13), 81/132 (K) (5), 81/247 (K) (17), 81/248 (K) (24), 81/2658 (K) (13), 82/31 (K) (11), 82/44 (K) (13); Longnot & Verdcourt 3200 (K) (6e); Looe, P. P1048 (K) (17); Lord, J. K. 8169 (K) (13); Lovett, J. 1612 (K) (13), 1637 (K) (4); Lovett, J. & C. Congdon 1404 (K) (13), 1931 (K) (13); Lowe, J. 1379 (K) (16), 1484 (K) (23), 1671 (K) (16), 2760 (K) (16), 3378 (K) (6f), 4463 (K) (23), 4828 (K) (16), A12 (K) (13); Lugard, E. J. 127 (K) (13), 164 (K) (13); Luke, W. R. 2459 (K) (11), 3054 (K) (13), 3390 (K) (13), 3489 (K) (20); Lye, K. A. 4747 (K) (11), 5379 (K) (13), 9078 (K) (13), s.n. (K) (17); Lynes, H. 18 (K) (10), 53 (BM) (13), 577 (BM) (11), 578 (BM) (24).

Mabberley & McCall 86 (K) (17); Macaulary 867 (K) (6b), 927 (K) (6b); MacCintosh, D. G. 103 (K) (16); MacDonald, W. 21 (K) (13); MacOwan, L. 426 (GH) (10); Magaji, S.O. M6660 (K) (16); Magogo, F. C. 373 (K) (27); Magogo, F. C. & R. Estes, 1152 (K) (17), 1152 (K) (22), 1153 (K) (17), 1153 (K) (22); Magogo, F. C. & P. Glover 1050 (K) (27), 1089 (K) (4); Magogo, F. C. & R. R. Innes 849 (K) (27); Maitland, J. 103 (K) (11), 1926 (K) (16), 1946 (K) (16), s.n. (K) (11), s.n. (K) (16); Mansfield, R. A. 9/4/78 (ODU) (22), 9/4/78 (ODU) (7); Marmo, V. 36 (K) (23); Masierson, G. 217 (K) (3); Massey, R. E. 47 (K) (16); Mathew, B. 6126 (K) (6e); Mauteiro 6193 (K) (13); Mavi, S. 626 (K) (6b); McCintosh, D. G. H. 3k (K) (17), 57k (K) (11), 109k (K) (11); McClean, A. 595 (K) (6b); McClean, B. 209 (K) (6b); McClounie, T. 60 (K) (4), 178 (K) (3); McDonald, J. 910 (K) (16); McGillett 1007 (K) (13); Mearns, E. A. 2885 (GH) (11), 3005 (GH) (16); Meel, L. V. 1432 (K) (17); Meikle, R. D. 746 (K) (16), 768 (K) (23), 1011 (K) (6a); Melville, F. A. & T. Hooker 287a (K, MO) (23); Mesfin et al. 4058 (K) (6e); Methew, L. 162 (K) (6b), 257 (K) (27); Meurillon, A. 1363 (K) (5), CNAD577 (K) (23); Meurillon, A. et al. 1976 (K) (16); Meyer, F. G. 7594 (K, US) (16), s.n. (K) (16); Meyers, J. G. 7329 (GH, K) (5), 7867 (GH) (19); Mgaza, C. D. 434 (K) (17); Michael 9531 (K) (6d), 9706 (K) (6d); Michel, B. 13 (K) (11); Michel, G. 5367 (K) (4); Migeod, F. W. 13 (BM) (27), 35 (BM) (27), 50 (BM) (27), 730 (BM) (27); Mildraed, 1–232 (K) (17), 9501 (K) (17); Miller, H. 3/1896 (K) (23); Miller, O. B. 1590 (MO) (6b), 1939 (K) (13), 2630 (K) (6b), 2671 (K) (6b), 4827 (K) (6b), 5737 (K) (6b), 7260 (K) (6b); Miller et al. 615 (BM) (13); Milne-Redhead, E. 3577 (K) (6b), 3756 (K) (17), 4018 (K) (10), 4155 (BM, K) (11), 4161 (K) (2), 5043 (K) (6f); Milne-Redhead, E. & B. Mhroro 9693 (K) (4); Milne-Redhead, E. & P. Taylor 882 (K) (17), 8421 (K) (27), 9524 (K) (13), 10018 (K) (13), 10024 (K) (3), 10577 (K) (3); Mitchell, B. L. 24/78 (K) (11); Mitchison, N. 1975 (K) (13), 1975 (K) (4); Mitte 314 (US) (16); Mogg, A. O. 5935 (MO) (6b), 30317 (K) (17); Moggridge, F. Y. 548 (K) (4), 1868 (US) (16); Mohamed, K. I. 10/25/88 (ODU) (13b), 10/26/88 (ODU) (16), 10/26/88 (ODU) (13e), 10/27/88 (ODU) (16); Moiser, B. 63 (K) (13), 9 (K) (16); Moll, E. J. 4723 (K) (6b); Moomaw, J. C. 953 (K) (27); Mooney, H. F. 8427 (K) (17); Moriarty, A. 441 (K) (17), 469 (K) (27); Morton, J. K. 94 (K) (23), 1104 (K) (23), 1677 (K) (13), 2527 (K) (19), 6123 (K) (6e), 6214 (K) (16), 6224 (K) (16), 6292 (K) (19), 7171 (K) (6e), 8794 (K) (6e), 8795 (K) (6f), 9370 (K) (23), A663 (K) (6f), A1394 (K) (16), A2045 (K) (6e), A3016 (K) (6f), A3295 (K) (7), A3488 (K) (6e), A3926 (K) (6e), A4241 (K) (26), GC8601 (K) (26), s.n. (K) (5), s.n. (K) (23); Morton, J. K. & J. M. Dalziel 145 (K) (6e); Morton, J. K. & D. Gledhill 1093 (K) (1), 3035 (K) (19), 18771 (K) (1); Mouculie, A. 574 (K) (13); Mouteiro 6143 (K) (23); Mugwedi, E. 1371 (K) (4); Muller, P. J. 2205 (K) (6b); Murray, A. L. 426 (K) (10); Musselman, L. J. 124 (K) (11), 198 (K) (24), 6118 (ODU) (7), 6122 (ODU) (5), 6123 (ODU) (5), 6124 (ODU) (5), 6131 (ODU) (7), 6139 (K, ODU) (16), 6140 (ODU) (16), 6143 (ODU) (16), 6144 (K, ODU) (16), 6145 (K, ODU) (16), 6152 (ODU) (16), 6154 (K) (16), 6155 (K) (16), 6162 (K, ODU) (16), 6174 (ODU) (13), 6180 (ODU) (13a), 6212 (K) (16), 6231 (K) (24), 6256 (K) (24), 6260 (K) (17), 6269 (ODU) (13d), 6279 (K, ODU) (16), 7003 (ODU) (4), 7011 (ODU) (6b), 7015 (ODU) (4), 7022 (ODU) (4), 7030 (ODU) (10), 7032 (ODU) (6b), 7038 (ODU) (10), 7039 (ODU) (10), 7040 (ODU) (6b), 7060 (K, ODU) (5), 7061 (ODU) (24), 7064 (ODU) (13c), 7085 (K, ODU) (5), 7086 (ODU) (11), 4/10/86 (ODU) (11), 4/9/86 (ODU) (11), 8/23/86 (ODU) (17), 8/23/86 (ODU) (13c), 8/23/86 (ODU) (24), 8/23/86 (K) (24), 10/13/88 (ODU) (5), 10/13/88 (ODU) (11), 10/16/88 (ODU) (19), s.n. (K) (24), s.n. (K) (17); Musselman, L. J. & R. A. Mansfield 5522 (ODU) (23), 5524 (ODU) (5), 5527 (ODU) (16), 5533 (ODU) (19),

5535 (ODU) (16); Musselman, L. J. & K. I. Mohamed 9/30/88 (ODU) (6e), 9/30/88 (ODU) (7), 10/1/88 (ODU) (5), 10/1/88 (ODU) (7), 10/1/88 (ODU) (13h), 10/1/88 (ODU) (16), 10/1/88 (ODU) (17), 10/2/88 (ODU) (5), 10/2/88 (ODU) (7), 10/2/88 (ODU) (17), 10/2/88 (ODU) (22), 10/4/88 (ODU) (5), 10/4/88 (ODU) (7), 10/4/88 (ODU) (17), 10/4/88 (ODU) (22), 10/4/88 (ODU) (24), 10/5/88 (ODU) (5), 10/5/88 (ODU) (22), 10/6/88 (ODU) (5), 10/6/88 (ODU) (7), 10/6/88 (ODU) (13c), 10/8/88 (ODU) (5), 10/8/88 (ODU) (17); Musselman, L. J. & J. H. Visser 4/2/86 (ODU) (13); Musselman, L. J. et al. 7 (K) (19), 064 (ODU) (13c), 7063 (ODU) (24), 7066 (ODU) (13c), 4/9/86 (ODU) (11), 4/17/86 (ODU) (4), 9/4/86 (ODU) (4), 10/13/88 (ODU) (17), 10/13/88 (ODU) (5), 10/16/88 (K, ODU) (6d), 10/16/88 (ODU) (23), 10/16/88 (ODU) (13g), s.n. (K) (19), s.n. (K) (23); Mutch, M. I. 27952 (K) (16); Mutimushi, J. M. 537 (K) (10), 932 (K) (6b); Mwasumbi, L. B. 10487 (K) (11); Myers, J. G. 6656 (K) (17), 6997 (K) (11), 7000 (K) (17), 7329 (K) (5), 7336 (K) (17); Myres, R. F. 294 (K) (17), 303 (K) (6b).

N.D.H 7361 (K) (13); Nafuer, E. R. 5343 (K) (16); Napier, E. R. 51 (K) (4), 957 (K) (20); Napper, D. & R. Faden 1839 (K) (20); Nation, O. 29 (K) (10), 143 (K) (13), 313 (K) (6b); Ncube, M. 75 (K) (11); Nelson, W. 394 (K) (10); Nesbould, J. G. 1958 (K) (4); Newberreu, R. J. 6 (K) (23); Newbould, J. G. B. 1958 (K) (13); Ngoni, J. F. 160 (K) (13), 295 (K) (13), 1249 (K) (6b); Niamir, M. 17 (K) (13); Nicholas, A. & V. D. Berg 1736 (K) (6b); Nicholas, A. & D. Neave 2109 (K) (6b); Nichols, E. H. 11 (K) (23); Niger 495 (UPS) (16); Nilson, J. 332 (K) (6e); Noak, S. L. 311 (K) (10); Noble, H. L. 30 (K) (16), 31 (K) (16); Norlindh, T. & H. Weimarck 4878 (K) (3), 4956 (K) (17), 44347 (K) (6b); Norman, E. M. 294 (K) (16); Norrgrann, G. 459 (K) (4); Nuvunga, A. 471 (K) (3).

Okafor, J. C. 46885 (K) (23); Olmuntus, B. 2507 (K) (6e); Olorunfemi, J. 55046 (K) (16); Olufsen, O. 479 (K) (13), 705 (K) (23), 1927 (K) (23); Onochie, C. F. A. 18697 (K) (6e); Onsow, M. P. 709 (K) (6f); Onwudinjo, D. C. 24005 (K) (11); Ortendahl, V. 487 (UPS) (13a); Ossent, J. 478 (K) (13).

Padva, J. H. 326 (K) (17); Paget-Wilkes, C. F. 700 (MO) (27); Panayotis, L. J. 98 (K) (17); Parker, C. 985 (GH) (23), 1066 (ODU) (11), 1316 (ODU) (13f), 1976 (K, ODU) (5), 1977 (ODU) (5), 1978 (K) (5), 1979 (K) (16), 1994 (ODU) (16), 2023 (K) (13), 2031 (K, ODU) (13d), 2031 (K) (13), 2044 (K) (13), 2046 (K) (5), 2210 (ODU) (11), 2264 (ODU) (13h), 2265 (ODU) (13f), 2306 (ODU) (16), 2312 (ODU) (13d), 2314 (ODU) (5), 2316 (ODU) (16), 2317 (ODU) (16), 2318 (ODU) (5), 2321 (ODU) (16), 2332 (ODU) (16), 2443 (ODU) (4), 2682 (K) (7), 2984 (ODU) (20), 3215 (ODU) (5), 4001 (ODU) (22), 4034 (K, ODU) (20), 4041 (ODU) (17), 4065 (K) (5), 4074 (K) (17), 4075 (ODU) (16), (K) (16), E22 (K) (16), GM/522/H (K) (20); Parkinson, V. 1985 (ODU) (24), 9/18/85 (ODU) (22), 9/17/86 (ODU) (7), A1 (K) (24), A3 (K) (16), A4 (K) (16); Parsons, D. A. L79 (K) (16); Pasch 7846 (K) (16), 7916 (K) (16); Patel, I. H. & W. Nachamba 1775 (K) (11); Paterson, A. 59 (K) (11); Paulo, S. 105 (K) (27); Pawek, J. 1649 (K) (17), 3349 (K) (4), 4112 (K) (27), 5135 (K) (13), 5266 (K) (13), 7799 (K) (6e), 8301 (K) (17), 9499 (K) (17), 9575 (K) (17), 9601 (K) (13), 10942 (K) (17), a12015 (MO) (27), b12015 (K) (3), 12317 (K, MO) (6e), 12566 (K) (4), 13856 (K) (17), 13913 (K) (11), 13954 (K, MO) (11), 14332A (K) (14), 14332B (K) (11); Pearson, H. H. 2038 (K) (13), 2421 (K) (13), 8122 (K) (13); Perceval, A. B. 1901 (MO) (10); Pereira, J. A. 2328 (K) (19), 2368 (K) (19), 2984 (K) (21), 2984 (K) (6a), 3580 (K) (16); Peters, 8 (K) (13); Peterson, C. 823 (K) (17), 833 (K) (10); Petherick 1862 (K) (17), 1863 (K) (16), Petterson, B. 16819 (K) (16); Pfund, J. 86 (K) (24), 679 (K) (16); Philcox, D. & R. B. Drummond 070 (K) (13), 9050 (K) (17), 9054 (K) (3), 9094 (K) (13); Philcox, D. & M. J. Leppard 8574 (K) (13), 8575 (K) (13), 8677 (K) (24), 8718 (K) (13), 8870 (K) (17); Philcox, D. & T. Muller 9080 (K) (6b), 9083 (K) (13); Philcox, D. et al. 8563 (K) (17), 8610 (K) (17), 8748 (K) (13), 8796 (K) (11), 8799 (K) (13), 8933 (K) (10), 9017 (K) (6b), 9019 (K) (10), 9093 (K) (3), 9127 (K) (3), 9873 (K) (4), 9908 (K) (17), 10170 (K) (6b), 10190 (K) (17), 10210 (K) (14); Phillips, E. 661 (GH, MO) (6e), 832 (K, MO) (6e), 1215A (MO) (6e); Phillipson, P. B. 138 (MO) (6b); Phipps, J. B. 342 (K) (6b), 2594 (K) (4); Phiri, R. 79 (K) (4); Pichi-Sermolli, R. 1295 (K) (16), 1296 (K) (13); Pielou, D. P. 130 (K) (13), s.n. (K) (17); Plant, H. 706 (K) (6a); Plowes, D. C. 32013 (K) (13); Pobeguin, M. 364 (K) (6f), 1020 (K) (5); Polhill, C. 496 (K) (17); Polhill, R. & S. Paulo 579 (K) (13), 950 (K) (13); Poulo, S. 105 (K, MO) (27); Powell, J. H. 876 (K) (4); Powys, 197 (K) (10); Prince, S. D. 116 (K) (4), 200 (K) (24), 215 (K) (11), 401 (K) (24); Probegum, M. 364 (K) (6e); Prosser, D. U. 1643 (K) (6b), 1784 (BRE, K) (18); Puff, C. & E. Kelbessa 921220 (K) (20); Puff, C. et al. 8209 (K) (20), 820922 (K) (16); Purseglove, J. W. 487 (K) (16), 560 (K) (16), 1609 (K) (6e), 2053 (K) (11), 2711 (K) (6a), P2424 (K) (17); Pusch, 2689 (K) (4).

Quarre, 1451 (K) (11).

Radjil 594 (GH) (16); Ragslane 1251 (US) (6e); Ramaiah, K.V. 2973 (K) (24); Ranger, G. A. 304 (K) (10); Rax, R. D. 292 (K) (24); Raymond, R. J. 319 (K) (17); Raynal, A. R. 2282 (K) (7), 22057 (K) (7), 22063 (K) (13), 22127 (K) (5), 22139 (K) (7), 22149 (K) (5), 22181 (K) (7), 22194 (K) (16), 22196 (K) (7), 22200 (K) (16), 22210 (K) (16), 22211 (K) (13), 22220 (K) (16), 22221 (K) (16), 22244 (K) (13), 22263 (K) (16), 22277 (K) (24), 22290 (K) (5), 22309 (K) (5), 22394 (K) (5), 22395 (K) (5), 22435 (K) (7), 22526 (K) (16), 22565 (K) (13), 22573 (K) (16), 22581 (K) (5), 22602 (K) (16), 22603 (K) (13), 22613 (K) (13), 22636 (K) (13), 22640 (K) (7), 22641 (K) (24); Read, J. G. 10 (BM, K) (10), 27 (BM, K) (10); Reading University/BM 292 (BM) (13); Red, E. 1424 (K) (17); Reed, S. W. 16290 (K) (11); Reed 14 (K) (16), 3/1888 (K) (4); Reekmans, M. 4257 (K) (17), 6786 (K) (6e), 6926 (K) (13), 7125 (K) (6a), 7166 (K) (6a), 9834 (K) (13), 10314 (K) (17), 23/2/75 (K) (11); Rehmann, A. 4671 (K) (13); Rensburg, H. J. 1516 (K) (13), 2772 (K) (11), 23107 (K) (13); Revell, R. J. 321 (K) (17); Richards, H. M. 657 (K) (13), 668 (K) (11), 676 (K) (6b), 1169 (K) (6b), 1771 (K) (27), 4205 (K) (6b), 4512 (K) (13), 4699 (K) (6b), 4780 (K) (11), 4813 (K) (13), 5230 (K) (4), 5423 (K) (13), 7425 (K) (6b), 9026 (K) (13), 9103 (K) (11), 10542 (K) (6e), 10763 (K) (6b), 10921 (K) (13), 10953 (K) (6b), 12222 (K) (11), 12486 (K) (13), 12570 (K) (6b), 12813 (K) (13), 14824 (K) (11), 14858 (K) (13), 15025 (K) (6b), 16275 (K) (6b), 17147 (K) (6b), 17965 (K) (13), 17980 (K) (4), 19831 (K) (13), 24360 (K) (4), 24897 (K) (20), 25019 (K) (10), 25389 (K) (6e), 25465 (K) (13), 26863 (K) (20), 28461 (K) (13); Richie, A. H. 1924 (K) (4); Riches, C. R. 226 (K) (16), 228 (K) (16), 230 (K) (5), 233 (K) (5), 234 (K) (16), 242 (K) (16), 243 (K) (7), 249 (K) (16), s.n. (K) (5); Robert, G. 16608 (K) (6a); Robertson, S. A. 108 (K) (4), 676 (K) (11), 4121 (K) (20); Robertson, V. C. 5 (K) (11), 31 (K) (16); Roberty 16608 (K) (21), 16621 (K) (23); Robin, R. J. 3839 (K) (13), 4339 (K) (13), 4513 (K) (13); Robins, S. 902 (K) (13); Robinson, E. A. 637 (K) (23), 1214 (K) (3), 1847 (K) (6b), 1961 (K) (10), 2176 (K) (13), 3330 (K)

(6b), 4024 (K) (6b), 6174 (K) (10), 6403 (K) (11), 6753 (K) (6b), 6897 (K) (13); Robson, N. K. B. 1083 (K) (17), 1094 (BM, K) (3), 1169 (BM) (10), 1487 (K) (13); Robson & Jackson 1179 (K) (10), 1199 (BM, K) (11); Robyn, L. 1971 (K) (17), 1980 (K) (13), 2216 (K) (16); Rodin, R. J. 9379 (K) (16); Roger 758 (K) (19); Rogers 1821 (GH) (16), 20943 (US) (10); Rogers, C. G. 560 (K) (10), 709 (K) (11), 740 (K) (11); Rogers, D. 96 (US) (4), 1493 (US) (6b); Rogers, F. A. 7023 (K) (13), 8215 (K) (13), 18297 (K) (6b); Rose, F. 10117 (K) (17), 10253 (K) (17); Ross, J. H. 1743 (K, MO) (10), 2240 (K) (6b); Rounce, N. V. 288 (K) (4), 355 (K) (11), 358 (K) (13), 405 (K) (13); Rowland 1893 (K) (23); Rudatis, F. 543 (US) (6b), 1829 (S) (6b); Rushworth, J. E. 1489 (K) (17); Russell, J. 41 (K) (6b); Russell, T. 4 (K) (17); Rutherford-Smith, R. O. 542 (K) (4), 565 (MO) (6b); Ruxton, J. P. 53 (K) (13), 67 (K) (11), 149 (K) (11), 152 (K) (5); Rwaburindore, P. K. 580 (MO) (6e), 817 (MO) (6e), 1813 (US) (11); Ryan, J. B. H40/33 (K) (11); Ryan, J. D. 28 (K) (16), 58 (K) (16); Ryder, E. F. 102 (K) (10); Ryding, O. 120 (UPS) (16); Ryding, O. et al. 1548 (K) (16), 1567 (K) (16).

Saadou, M. 1839 (K) (5); Safa, S. B. & L. J. Musselman 10/3/87 (ODU) (6e), 10/9/87 (ODU) (13g), 10/9/87 (ODU) (16), 10/9/87 (ODU) (24), 10/9/87 (ODU) (7), 10/10/87 (ODU) (13h), 10/10/87 (ODU) (5), 10/10/87 (ODU) (7), 10/12/87 (ODU) (5), 10/12/87 (ODU) (7), 10/13/87 (ODU) (22), 10/13/87 (ODU) (5), 10/13/87 (ODU) (7), 10/19/87 (ODU) (24), 10/21/87 (ODU) (6e), 10/21/87 (ODU) (7), 10/25/87 (ODU) (17), 10/25/87 (ODU) (22); Sallinho Botanical Exped. 3824 (K) (23); Salubeni, A. J. 278 (K) (13), 416 (K) (17), 424 (K) (11), 1330 (GH, K, MO) (14), 1341 (K) (14), 1453 (K) (17), 1539 (K) (14); Sanane, M. 980 (K) (6b), 1571 (K) (13); Sanders, J. R. 54 (K) (10), 62 (K) (4); Sanderson, J. 428 (K) (6b); Saunders, D. H. 7 (K) (16), 60 (K) (16), 62 (K) (16); Sawer, E. R. 13698 (K) (16), 13699 (K) (16); Saxer, A. 254 (K) (6d), 294 (K) (17), 308 (K) (16), 309 (K) (11), 398A (K) (16), 588 (K) (16); Schenpera, J. C. 1048 (K, MO) (6b); Schimper, M. W. 319 (K) (13); Schinz, H. 35 (K) (13), 42 (K) (16); Schlechter, R. 3814 (GH, K, MO) (6b), 3979 (GH, MO) (10), 4342 (K) (13), 4541 (GH) (4); Schlieben, H. J. 2108 (US) (14), 2281 (K, S) (27), 3874 (K) (11), 5791 (K) (13), 6021 (S) (27), 7662 (US) (10), 7668 (US) (6b); Scholes, J. S9 (K) (6e); Schuter, P. A. & A. Nuvunga 6644 (K) (6b); Schweinfurth, G. 179 (K) (11), 595 (K) (16), 1880 (US) (16), 1992 (S) (5), 2285 (K) (4); Schyff, H. 1897 (K) (11); Scott, H. 217 (K) (16); Semsei, S. R. 1720 (K) (27), A9/48 (K) (4); Seydel, R. 4491 (K, US) (13); Shannon, R. K. 88–39 (US) (5), 88–44 (US) (13); Shantz, H. L. 930 (K) (16); Shantz & Tanner 4196 (K) (13); Sherif, M. I. 3952 (K) (17); Shillito, E. M. 119 (K) (11); Shorland 179 (K) (16); Shuell 6785 (K) (19); Siame, W. 95 (K) (4), 112 (K) (11), 144 (K) (24), 144A (BM) (7), 164 (K) (13), 525 (MO) (6b); Sidey, J. L. 1287 (UPS) (6b), 1589 (MO) (6b); Sieber 2401 (GH, K) (4); Sighton, F. C. 1298 (BM) (22), 2042 (BM) (22); Sillitoe, F. 457 (K) (17); Simfsuz, N. D. 2166 (K) (16); Simon, B. K. & G. Williamson 1403 (K) (6b); Simpson, N. D. 7302 (K) (17), 7406 (K) (16), 7606 (K) (16); Simson, H. E. 348 (K) (16); Skarpe, C. 52 (K) (13); Smith, L. C. 10/92 (K) (20); Smith, P. A. 26 (K) (13), 390 (K, MO) (6b), 830 (K) (13), 845 (K) (4), 887 (K) (13), 1369 (MO) (10), 1376 (K) (13), 1970 (K, MO) (6b), 2259 (K, MO) (10), 3114 (K) (13); Smith, P. A. et al. 5872 (K) (13); Smith, S. H. 22673 (K) (11); Smuts, J. C. & M. C. Gillett 3399 (K) (6b), 4127 (K) (6b); Snowden, J. D. 1160 (K) (16); Someren, V. 250 (K) (17), 7651 (K) (13); Sommerville, S. S. 726A (BM) (11); Sousa, A. F. 445 (K) (6b), 555 (K) (4); Soyaux, H. 189 (K) (4); Speke & Grant 572 (K) (16); Spinagi, C. A. 361 (K) (17); Stee, J. V. 3163 (K) (4); Stewart, D. R. M. 327 (K) (11); Stewart, M. M. 1/1911 (K) (6b); Steyagi, M. F. s.n. (US) (16); Stirton, C. H. 401 (K, MO) (6b), 559 (K) (6b), 1458 (K) (10), 1725 (K) (13); Stocks, J. 55 (K) (27); Stolz, A. 213 (GH, US) (11), 540 (K) (17), 753 (K) (13), 1304 (BM, K, GH, MO) (14), 2494 (GH, MO) (10), 2500 (GH) (19); Strey, R.G. 6187 (K) (6b), 9297 (K) (6b), 9987 (K) (6b); Suabad, M. M. 6994 (MO) (23); Sutherland, D. 1856 (K) (10); Sutherland, J. 381 (MO) (13a); Swynnerton, C. F. 1413 (K) (13), 1451 (K) (27), 1951 (K) (27); Symes, Y.E. 112 (K) (11).

T.C.D. Biol. Exped. 210 (BM) (13); Tadesse, F. M. & K. Vollesen 3073 (K) (20); Tadesse, M. T. & G. Y. Yagnew 1594 (K) (16), 1600 (K) (16); Talbot, P. A. 308 (BM) (11), 310 (K) (16), 312 (K) (7), 313 (BM) (6d), 324 (BM, K) (23), 1920 (BM) (24); Tanner, R. 89 (K) (27), 129 (K) (4), 747 (K) (16), 810 (K) (4), 1690 (K) (10), 1979 (K) (4), 2197 (K) (27), 2658 (K) (27), 2850 (K) (27), 2879 (K) (11), 2904 (K) (11), 2947 (K) (4), 2954 (K) (22), 3018 (K) (4), 3996 (K) (13), 4142 (K) (16), 4290 (K) (16), 4461 (K) (10), 5108 (K) (6a), 5274 (K) (16), 5655 (K) (6a), S110 (K) (6a); Tapscott, S. 2548 (K) (10); Taylor, W. W. 1885 (BM) (11); Taylor, T. W. 1 (K) (17); Teague, A. J. 33 (K) (13); Teixerira, B. 303 (BM) (6e); Terry, P. J. 1879 (K) (5), 1942 (K) (5), 3104 (K) (5), 3135 (K) (5), 3173 (K) (5), 3384 (K, ODU) (20), s.n. (K) (16); Thomas 4429 (K) (6e); Thomas, A. S. 183 (K) (17), 1031 (K) (16), 1532 (K) (16), 2015 (K) (11), 2015 (K) (11), 2893 (K) (11), 3458 (K) (13), 3554 (K) (13), D138 (K) (6f); Thomas, D. 2452 (MO) (6d); Thomas, N. W. 155 (K) (6f), 603 (K) (6f), 3164 (K) (23), 3208 (K) (23), 5829 (K) (23), 6665 (K) (23); Thompson 10 (K) (23); Thomson, B. s.n. (K) (13); Thorneiop, G. 2206 (K) (11); Thorold, C. A. 209 (K) (6e), 251 (BM) (24); Thulin, M. & B. A. Mahamed 7088 (K) (13); Thulin, M. & B. Mhoro 488 (K) (4), 3140 (K) (4); Timberlake, J. R. 459 (K) (13); Tolken, H. & D. S. Hardy 919 (K) (13); Toms, K. E. 5 (K) (4); Toul Botanical Exped. 1464 (K) (23), 1699 (K) (23); Towa, E. 8166 (K) (19); Townsend, C. C. 170 (K) (17), 2162 (K) (13); Troprell, C. G. 2050 (K) (4); Troupin, G. 621 (K) (11); Tutin, C. E. 162 (K) (6a); Tweedie 638 (K) (4), 2448 (K) (13), 3314 (K) (13), 3360 (K) (13), s.n. (K) (4); Twuner, A. 6730 (K) (13); Tyson, W. 894 (GH) (6b), 1222 (GH) (4), 1368 (MO) (10), 1504 (GH) (4).

Vallance, G. B. 699 (K) (4), 700 (K) (4); Vallah 65 (K) (1); Vaughan, J. H. 402 (K) (11), 1613 (K) (11), 1614 (K) (17), 1664 (K) (11), 2328 (BM) (27); Verboom, W. C. 1039 (K) (13); Verdcourt, B. 581 (K) (13), 3330 (K) (6e), 3390 (K) (17), 3690 (K) (20); Vigne, C. 4359 (US) (6e); Visser, J. H. 248 (K) (10), 315 (K) (6b), 316 (K) (6b), 2528 (K) (13); Vollesen, K. 3311 (K, UPS) (24); Vrgine, G. 3355 (K) (6e); Vuuren, D. A. & W. Giess 1132 (K) (13).

Waitland 838 (K) (6e); Walich, Z. 1278 (K) (10); Wallace, G. B. 713 (K) (27); Walter, E. G. 10 (K) (13); Wanntop, H. E. 515 (K) (13), 760 (K) (13), 814 (K) (13); Welch, J. R. 174 (K) (16); Wellby, M. S. 1901 (K) (16); Wellman, J. C. 1769 (K) (4); Welwitsch, A. P. 779 (K) (13), 5851 (K) (10); Werdermann & Oberdieck 2236a (US) (4); Wham, J. R. D. 26/2/24 (K) (11); Whellar, J. A. 1188 (K) (24), 1214 (K) (11); White, F. 2048 (K) (13), 6213 (K) (10), 7574 (K) (11); White, M. 142 (K) (13); Whiteside, J. O. 107793 (K) (11), 130476 (K) (11); Whyte, A. 1898 (K) (16), 1898 (K) (17), 1902 (K) (13), 1912 (K) (13); Wickens, G. E. 309 (K) (16), 536 (K) (13), 568 (K) (16), 587 (K) (13), 628 (K) (16), 1562 (K) (23), 2063 (K) (24), 2099 (K) (17), 2241 (K) (17), 2306 (K) (24), 2332 (K)

(24), 2345 (K) (24), 2492 (K) (16), 2807 (K) (23), 3159 (K) (13), Wiehe, P. O. 28294 (K) (4), N/118 (K) (11), N/426 (K) (4); Wild, H. 599 (K) (11), 1631 (K) (13), 4315 (K) (10), 5718 (K) (17); William, M. 5975 (K) (13); Willemse, R. H. 30 (K) (16); Williams, G. R. 220 (K) (11); Williams, J. G. 5115 (K) (13), 12546 (K) (13), B5113 (K) (4); Williams, R. 545 (K) (16); Williams, R. H. 32 (K) (4); Williams, T. L. 534 (K) (6e); Williamson, D. J. 90 (K) (4); Wilson 349 (K) (16); Wilson, J. 373 (K) (13), 880 (K) (11); Winter, B. D. 2540 (K) (6b), 3372 (K) (13), 3995 (K) (6b), 4428 (K) (6b); Winter, B. D. & O. A. Leistner 5368 (K) (13); Winter, B. D. & W. Marais 4478 (K) (6b), 4479 (K) (13), 4567 (K) (10), 4731 (K) (13), 4913 (K) (6b); Winter, B. D. & H. J. Wise 4452 (K) (13); Wit et al. 166671 (K) (11); Wittle, D. 314 (K) (16); Wood, G. H. S. 726 (K) (6e), 805 (K) (13); Wood, J. M. 4/1908 (US) (4), 16 (K) (4), 20 (US) (4), 113 (K) (6b), 394 (K) (10), 440 (K) (11), 911 (US) (6b), 4276 (K) (13), 4934 (MO) (6b), 7252 (US) (6b), 7500 (US) (11), 9212 (GH) (6b), 10495 (MO) (6b), 10873 (US) (4), 10887 (US) (6b), 92715 (MO) (10); Woolhouse, H. W. 51/61/22 (K) (17); Worsdell, W. O. 12/1909 (K) (6b); Wright, J. M. 302 (K) (13); Wyld, J. W. 225 (K) (4), 725 (BM) (6a); Wylie, F. 1895 (K) (6b).

Yeafes, M. 88 (K) (16); Yong, J. D. 184 (K) (11); Young, J. 185 (K) (6f); Young, R. G. 1261 (ODU) (2), 1300 (MO) (1), 1347 (BM) (2), 1365 (MO) (2).

Zimmer, F. 102 (K) (27); Zunguze, D. & X. Boan 49 (K) (11).