

## THE ACACIAS OF SOUTHERN AFRICA.

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THERE is scarcely any book on travel in Southern Africa that does not contain some pages dedicated to the description of thorns and spines on plants. Although most of our travellers took very little interest in botany, they could hardly help paying considerable attention to a subject that was forcibly obtruded upon them every day. In the coast districts of the Cape Colony and in the regions extending towards the north-east spiny bushes or trees take a less prominent place in the vegetation of the country, and those armed with such weapons belong to several very different families. In the central regions however and especially in those vast tracts which extend north of the Orange River far beyond the tropic of Capricorn, one family, or to speak more properly one genus, of thorny trees comes to the front and impresses its character on the landscape. This is the genus *Acacia*. Two species of acacias are familiar to all of us, namely the common Karroo-thorn and the so-called Port Jackson willow. The latter is not indigenous to this country, but comes from Australia, and I may here mention, that the large genus *acacia*, which contains over 400 species, is distributed over three continents: Australia, Africa and America. On our continent it is principally found in the northern and southern countries; but our number of species is much inferior to that of Australia. The Port Jackson willow being a typical representative of the bulk of the Australian acacias, and the Karroo-thorn one of ours, the difference between the two branches of the genus is apparent.

There are nineteen species known from South Africa, six of which belong to the eastern coast districts, namely: *A. arabica*, *natalitia*, *raffra*, *spinoza*, *Kraussiana*, *pennata*, whilst three have been found only in the eastern Transvaal: *A. ferax*, *Burkei* and *eriadenia*. One species only, the above-mentioned Karroo-thorn, reaches our neighbourhood, the remaining nine species being restricted to the Kalahari region, where I collected them all but one. To these must be added seven new species which I discovered in Damaraland, namely: *A. hereroensis*, Engler; *A. trispinosa*, Marloth et Engler; *A. dulcis*,



Marloth et Engler; *A. Luderitzii*, Engler; *A. Marlothii*, Engler; *A. uncinata*, Engler; *A. ———* Engler and one new species from Griqualand West. These twenty-seven species are easily arranged in two natural groups according to their inflorescence, the one section bearing the flowers in glomerules, the other one in racemes.

Less scientific, although perhaps sufficient from a practical point of view, is the principle of classification which Baines\* mentions as established by Dr. Kirk. He divides them into three groups, viz., species which tear the clothes, those which tear the flesh and those which tear clothes and flesh.

For our purpose, however, I thought it best to adopt another plan and to deal firstly with the shrubby species and then with the trees, putting aside the two climbers (*A. pennata* and *Kraussiana*).

There are altogether fifteen species of the shrubby form, out of which number I may mention the seven most remarkable types.

*A. stolanifera*, Burch., the lowest of all of them, is common in Griqualand West. The branched underground stem sends up numerous straight twigs, 3 to 4 feet high, which, growing close together, form pretty little islands of fresh verdure on the rufous soil.

A much greater influence on the features of the country is exerted by *A. detineus* Burch., the *Haakedorn* of the colonists. It is a bush 6 to 10 feet high, sometimes forming thickets to the exclusion of all other shrubs. Such places are very trying to the traveller and particularly so to his oxen and the canvas-cover of his wagon. I cannot better illustrate this obtrusive plant than by quoting Burchell,† who named it *detineus* out of mere revenge. He made his first acquaintance with it shortly after he had passed the Orange River and he describes this interview as follows :

"I kept with two of the Hottentot waggons, but they led me through such close thickets of thorny bushes, and which seemed ready every minute to tear away the canvas from the tilts, and our clothes from off our backs, that I had given up all hopes of finding our way out of them till the morning. . . . The largest shrubs were about 5 feet high. . . ., and it is the same thorny bush which gave us so much annoyance the night before where it was above 7 feet high. I was preparing to cut some specimens of it; which the Hottentots observing, warned me to be very careful in doing so, otherwise I should certainly be caught fast in its branches. In consequence of

\* *Th. Baines*. Explorations in South Africa, p. 147.

† W. J. Burchell, Travels in the Interior of Southern Africa Vol. I., pp. 308 and 309. London, 1822.



this advice, I proceeded with the utmost caution, but, with all my care, a small twig caught hold of one sleeve. While thinking to disengage it quietly with the other hand, both arms were seized by these rapacious thorns, and the more I tried to extricate myself, the more entangled I became ; till at last it seized hold of the hat also ; and convinced me that there was no possibility for me to free myself, but by main force and at the expense of tearing all my clothes. I therefore called out for help, and two of my men came and released me by cutting off the branches by which I was held. In revenge for this ill-treatment, I determined to give to the tree a name which should serve to caution future travellers against allowing themselves to venture within its clutches."

I found a larger variety of this species in Damaraland which forms there bushes often some 20 feet high.

*A. trispinosa* Marloth et Engler, a new species from Damaraland, is a low bush, 3 to 6 feet high. I named it *trispinosa*, on account of it having three spines under each leaf. As the specimens show, this species possesses not only the two recurved hooks of the hookthorn, but also a third one between these two, which is bent in the opposite direction. It is a pity that Burchell did not make the acquaintance of this bush, for he would have certainly supplied us with a graphic account of the superiority of such an arrangement over the simple system of hooks on the hookthorn.

Another new species from Damaraland is *A. dulcis* Marloth et Engler. It forms bushes of nearly the same dimensions as the Damaraland variety of the hookthorn, but it is easily recognized by its white or reddish-white bark. It is remarkable for its producing a gum, which is quite different from the common acacia-gum, being sweet and eatable, so that it serves as a regular sweet-meat to the natives. Hence the name *dulcis*.

*A. haematosylon* Willd. forms shrubs or little trees, 5 to 10 feet high. Burchell found it near Griquatown, since which time it has not been recorded. I saw it in the neighbourhood of Kuruman. It differs from all the other species by its slender and elastic branches, drooping like a weeping willow.

*A. Oaffra* Willd. a native shrub of the Eastern districts may be mentioned, not on account of its weapons, which are comparatively small, but for its much larger leaves.

As the last member of this series I have to mention another new species from Damaraland, which I had named *inermis*, on account of its having no spines or prickles whatever, but the name of which has



been changed by Prof. Engler to that of *A. Marlothii*. Amongst all the South African species this is the only one which is unarmed.

There are eight species of acacias growing to the size of considerable trees.

I mentioned already the common Karroo-thorn (*A. horrida Willd.*), which abounds on the banks of rivers and water-courses in the countries east and north of us. It forms beautiful groves; for instance, on the banks of the Orange River, as may be seen from the charming painting in Burchell's book above quoted. It does not, however, always grow in such clumps of slender stems. In the Eastern Province, for instance near King William's Town, numerous isolated trees stand on the slopes of the hills, reaching a height of 20 to 30 feet, and in Damaraland I saw trees 50 feet high. Its name *horrida* has not been given without sufficient reason. The geminose spines, as white as ivory and often as long as a finger, are as sharp and pointed as a needle. Hence the branches of this acacia are very welcome to the traveller when he is obliged to erect a kraal for his cattle, for even the roaring of a lion will not terrify his oxen to such an extent that they would break through a fence of this kind.

Another species, *A. hebeclada* Dc., is also of a very variable size. Generally occurring only as a shrub, a few feet or yards high, it forms on more favourable places considerable trees with a trunk as thick as a man's body. This species, I think, boasts of more formidable weapons than any other one, for its strong and sharp hooks are often an inch long, and, being covered with a fine tomentum, not only lacerate the flesh, but produce a very painful itching, which lasts long after the wound has been inflicted.

Straight spines and recurved hooks are combined on another acacia, which Burchell named appropriately *A. heteracantha*, although there are several other species armed in the same manner. There is, however, no specimen known which with safety can be referred to this name. I thought first that a species pretty common in Griqualand West should be considered to be Burchell's *A. heteracantha*, but the shape of its legumes differs so widely from B.'s description, that it has been necessary to give it another name (*A. spirocarpoides Engler*). It is only 15 to 20 feet high, but another species, similar in its external appearance and differing also by its legumes (*A. Maras Engler*), grows to a lofty tree of 40 to 50 feet, adorning the valleys of Damaraland. These three species are, as I suppose, the *Hauk en steek* of the Dutch colonist, for the long spines prick the unfortunate victim which the hooks prevent from escaping.



The most important South African representative of this genus is the camelthorn, which name, however, is applied to two nearly allied species, the *A. Giraffæ* of Burchell and the *A. erioloba* of Meyer. The first one, the *Mokáala* of the Betchuanas, was formerly common enough in the Free State, Transvaal and Bechuanaland, the other one, the *Omumbonde* of the Hereros, takes the place of the former in the western parts of the Kalahari region. I said, that the *Mokáala* was formerly common in the countries north of the Great River, but it is not so any more. For more than fifteen years all the steam-boilers of the Diamond Fields have been heated with its wood, which almost equals coal in respect to its heating power, and it is therefore not surprising that this tree has nearly disappeared from the country within several hundred miles round Kimberley. Before the completion of the railway to Kimberley, thirty to forty wagon-loads of this wood were brought to market every day, which amounts to a yearly consumption of 5,000 tons. The wholesale destruction of the *Mokáala* in a country which is almost deficient in other trees of remarkable size is very much to be regretted, for it has considerably increased the dreariness and monotony of these regions. A full grown *Mokáala* is a beautiful tree. It is not often over thirty-five feet in height, but the thick trunk, two or three feet in diameter, bears an umbrella-shaped crown, resembling thus in the distance the famous stone-pine of Italian and Greek landscapes. In former times hills and plains of those vast northern territories were adorned with scattered *Mokáalas* and the sun-burnt traveller could pull up his wagon under its shady roof, but now, having once left the willow-fringed banks of the Orange and Vaal rivers, he may pass along for many a day without perceiving a single tree rising above the shrubs of the hookthorn and vaalbosch (*Tarchonanthus minor* Burch.).

The other camelthorn, the *Omumbonde*, reaches the same dimensions as the *Mokáala*, but it never assumes such picturesque form having more resemblance to an old knobby oak.

Both trees differ from all other acacias in the shape and size of their pods.

The last acacia which I intend to deal with here is the *Ana-tree* (*A. albida* Del.). It is not a South African species properly speaking, occurring principally in Western Central Africa and in the regions of the Upper Nile, but it comes within our limits on the northern border of Great Namaqualand. It is the biggest of all our acacias, having a trunk often four feet in diameter and a height of sixty feet. The large crown is generally hemispherical with fresh, rich foliage,



and such trees, which abound along the river beds of those countries, afford therefore much better shelter against the sun than any other species.

The legumes of the ana-tree are broad, twisted, and not leathery as are those of the other acacias. They are farinaceous and constitute a very valuable food to herbivorous animals. This is probably one of the reasons for the comparatively wide distribution of the ana-tree, for the hard seeds pass undigested through the animals which have fed on its pods.

Having become acquainted with the principal representatives of this genus, it will be of some interest for us to throw a retrospective glance on the various forms we have met with. We have seen some species which are only a couple of feet high and others which raise their lofty heads high above any other indigenous tree. We have admired the rich foliage of the ana-tree and looked almost with pity at the few poor leaves of the hookthorn. We found a greater variety still in the formation of the pods and spines. The pods are of all shapes and sizes; linear, moniliform, oval or half-moon shaped; straight, bent, sickle-shaped or twisted; thin and papery, leathery, woody or mealy, and from one inch to six inches long.

Fir spines, or in some cases the prickles, are straight or recurved, or both kinds are combined on the same branch; they are short or long, thin or thick, glabrous or pubescent, rigid or elastic. They occur mostly in pairs, one species however having three under each leaf and one species only being entirely destitute of them.

The question arises: What are the causes of such variety of forms in a comparatively small number of species? Or since our knowledge of the matter at present is not sufficient to enable us to grapple with the whole of such a complicated problem, we may at least ask: Can any relation be shown to exist between certain peculiarities of these plants and their surroundings, especially as far as climate, rainfall, soil, etc., are concerned?

We are accustomed to find the larger forms of nearly allied plants in localities which have an ampler supply of water, but this common rule does not hold good in this case, as a comparison between the Karroo-thorn for instance and the camelthorn shows. The former although growing on the banks of perennially flowing rivers, is much inferior in its dimensions to the latter, which prefers dry plains and stony hills.

"It is surprising," says Grisebach in his book *Die Vegetation der Erde*, "that such a delicate thing as the acacia-leaf is able to exist



under the scorching sun of the desert, where all the other bushes bear thick and leathery leaves."

There can be no doubt that the acacia-leaf does possess some means of protection against the detrimental effects of heat and sun, and we find on examining the different species with regard to this point, that the leaves are the very organs where adaptation to circumstances has reached a high degree of perfection. We have already seen how economical for instance the common hookthorn is in the production of leaves as compared with other species of moister situations, but it is not so much the quantity of the foliage as the structure of the leaves, which enable them to exist under such trying conditions.

Almost all the acacias, and especially those which inhabit the desert-regions, contain in their sap a certain amount of gum and the juice of their leaves is more viscid and less watery than that of other plants. It is obvious that this peculiarity of the leaf tends to lessen the loss of moisture, for a slimy, gummy, fluid evaporates more slowly than an aqueous one.

Another very effective arrangement for the protection of the leaf is its periodical motion. In the morning the leaflets open and stand out almost horizontally, but towards 10 or 11 o'clock, when the insulating heat of the sun becomes more intense, the leaflets rise towards their rachis until the two upper sides of each pair touch each other. The twofold advantage gained by this change of position is apparent. The leaflets, turning their edges towards the sun instead of the broad surfaces, are thus enabled to avoid the direct effect of the sun's rays and as each pair then exposes only two sides to the hot air instead of four, their transpiration must be less than in the former position. In the afternoon, when the greatest heat has passed, the leaves open a second time, closing again about sunset on account of the cooler night. In *A. destineus* this arrangement is so perfect, that even large bushes throw almost no shade in the middle of the day and there is nearly as much sunshine under such a bush as at the side of it.

The most striking difference, however, between the species which grow in dry localities and those which are only found where subterranean water is present, is to be observed in the anatomical structure of their leaves. Taking again for comparison the karroo-thorn and the camelthorn and examining transverse sections of their leaflets under the microscope we find that the tissue of the former is formed of large cells with considerable intercellular spaces, and that the



epidermis consists of comparatively large cells with thin outer-walls, but in the latter the cells of the tissue close tightly together and the cells of the epidermis are provided with a very thick outer-wall. This wall measures in the former case only 3 to 5  $\mu$ , but in the latter 15 to 18  $\mu$ . The Karroo-thorn like the ana-tree grows only along the rivers, or at least on such spots where underground water exists, and they can therefore well afford to lose a considerable amount of moisture by transpiration, but the inhabitants of dry hills or plains, such as the camelthorn and the hook-thorn for instance, must economize the precious liquid and prevent its loss by all available means.

But it is not only against the climate that the acacia-leaf must be protected.

What purpose, the inquisitive observer of nature will ask, is served by all these nasty spines and prickles, which appear to be there only to worry the traveller? The answer to that question is not far to seek. Linnæus already called the thorns the weapons of the plants, and it strikes us at once, that the spines and hooks of the acacias protect their leaves against the attacks of grazing animals. In a desert like the Kalahari where no blade of grass can exist for many months of every year, whilst the country often teems with large game, the delicate leaves of the acacias would be completely destroyed year after year were they not so well protected.

I have made an interesting observation bearing on this question. Young bushes of the karroo-thorn as well as of the camelthorn possess always the longest and most numerous spines, whilst those of older and higher bushes are reduced in size and number. Young twigs of the camelthorn for instance bear spines about two inches long, but on older trees they seldom reach half an inch. As long as the bush is low its leaves must be well protected, but once grown to sufficient height it is no longer exposed to the attacks of game, and the material which is not required for the construction of spines can be employed for other purposes, as for instance, for the production of fruit.

These relations between the acacias of South Africa and their surroundings remind us that if we desire to understand the peculiarities of the vegetation of a country we must study, not only the floral characters of the plants, but also their biology, for the members of the vegetable kingdom are as well adapted to the peculiar requirements of the position which they occupy as animals to theirs. I think it is apparent even from the few observations which I have mentioned above, that this group of plants serves remarkably well to illustrate this natural law.





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