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CHROMOSOME NUMBER DETERMINATIONS FOR NEWFOUNDLAND SPECIES OF *ANTENNARIA* GAERTNER (ASTERACEAE: INULEAE)

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ABSTRACT

Chromosome numbers were determined for 54 individuals of Newfoundland *Antennaria* representing 8 species: *A. cana* ($2n=56$), *A. columnaris* ($2n=56$), *A. confusa* ($2n=56$), *A. eucosma* ($2n=56$), *A. gaspensis* ($2n=56$), *A. howellii* ($2n=56$), *A. pulvinata* ($2n=56$), and *A. staminea* ($2n=56$). The tetraploid determinations for populations of both *A. eucosma* and *A. howellii* (reported as *A. neodioica*) support previous determinations for these two species. Chromosome number determinations for all other species represent first reports.

Key Words: *Antennaria*, Newfoundland, chromosome numbers, taxonomy

INTRODUCTION

The dioecious genus *Antennaria* occurs predominantly throughout the cold temperate and arctic regions of the Northern Hemisphere. Polyploidy is extensive in the genus, as is the associated agamospermy. Chromosome number determinations are available for approximately 2500 individuals of North American *Antennaria* representing 66 described species and 15 naturally occurring hybrids (Stebbins, 1932a,b; Love and Love, 1964, 1982; Johnson and Packer, 1968; Mosquin and Hayley, 1968; Strother, 1972; Packer and McPherson, 1974; Bayer and Stebbins, 1981, 1987; Morton, 1981; Urbanska, 1983; Bayer, 1984, 1988, 1989a,b,

1990, 1991, 1992; Chinnappa, 1984, 1986; Evert, 1984; Bayer and Crawford, 1986; Chmielewski and Chinnappa, 1988a,b, 1990). Of these reports, only two, Morton (1981) and Urbanska (1983), have documented chromosome numbers for Newfoundland species of *Antennaria*, specifically six tetraploid determinations for *A. eucosma* Fernald and Weigand.

Reproductive mode in association with polyploidization have directed the evolutionary history of the genus. These factors combined with hybridization have led to the formation and establishment of numerous, morphologically variable, races and clones, many of which are apomictic. Fernald (1933) stated that 16 species and 2 varieties of *Antennaria* occurred on the island of Newfoundland. These taxa are, however, technically difficult and the status of some of these taxa has since been questioned (*e. g.* Bouchard *et al.*, 1991) and various resolutions proposed (*e. g.* Bayer, 1989c; Bayer and Stebbins, 1993; Chmielewski, 1993, 1994). Chmielewski (1994) most recently placed *A. bayardi* Fernald, *A. brunnescens* Fernald and *A. foggii* Fernald in synonymy with *A. pulvinata* Greene. Widespread acceptance has not yet occurred for any of the recently proposed changes. Revision of the Newfoundland *Antennaria* is necessary, however, to determine whether 8 of the taxa cited by Fernald (1933), that is, *A. albicans* Fernald, *A. cana* (Fernald & Wiegand) Fernald, *A. columnaris* Fernald, *A. gaspensis* Fernald, *A. petaloidea* (Fernald) Fernald var. *subcorymbosa* (Fernald) Fernald, *A. straminea* Fernald, *A. vexillifera* Fernald, and *A. wiegandii* Fernald legitimately warrant rare status and therefore protection (see Bouchard *et al.* 1991) or more appropriately should be placed in synonymy with other species and therefore relieved of this designation. Additionally, the status of *A. confusa* Fernald, *A. eucosma*, Fernald and Weigand, *A. neodioica* Greene var. *attenuata* Fernald, *A. neodioica* var. *chlorophylla*

Fernald, *A. neodioica* var. *typica* Fernald, *A. rupicola* Fernald and *A. spathulata* (Fernald) Fernald need to be established as these taxa were excluded from the rare list for Newfoundland because they: (1) were considered to be too widespread or common in their habit, even though they may be restricted geographically or (2) are minor variants of other more widespread or common species (Bouchard *et al.* 1991).

The only study to date which has dealt specifically, but not exclusively, with documenting morphological variation in Newfoundland species of the genus *Antennaria* is that of Chmielewski (1994). Until a satisfactory, detailed, taxonomic treatment of the Newfoundland *Antennaria per se* is prepared, the nomenclature proposed by Fernald (1933) and Chmielewski (1994) for these taxa will be retained. The present report which deals with chromosome number determinations for these taxa is intended to stimulate subsequent revisionary studies.

MATERIALS AND METHODS

Rootstocks were washed free of soil particles and debris in the field and subsequently returned to the campus greenhouse where they were transplanted into a mixture of equal parts soil, vermiculite and sand. Plants were watered as necessary and grown under natural daylight conditions and a temperature range of 15-25°C. Voucher specimens were identified using the key to Newfoundland *Antennaria* following Fernald (1933) and Chmielewski (1994). All vouchers of *Antennaria cana* (Fernald and Weigand) Fernald, *A. columnaris* Fernald, *A. confusa* Fernald, *A. eucosma* Fernald and Weigand, *A. gaspensis* Fernald, *A. howellii* Greene, *A. pulvinata* Greene, and *A. staminea* Fernald were collected by the author and subsequently deposited at SLRO (Holmgren *et al.*, 1990). Duplicate collections were deposited at MT.

Mitotic chromosome counts were made from root-tips that were collected at approximately mid-morning of sunny days, treated with a saturated PDB solution for 2 h, fixed in a mixture of ethanol and glacial acetic acid (3:1), subsequently hydrolized in 1N HCl at 60°C for 10-15 minutes and then squashed in 2% acetic orcein stain.

RESULTS AND DISCUSSION

Chromosome numbers were determined for 54 individuals representing 8 species of *Antennaria* (Table 1). The somatic chromosome number of 56 is widespread in the genus and in North America is generally considered to represent the tetraploid condition as no species with somatic numbers lower than 28 have been reported. European authors have, however, historically treated the somatic count of 28 as tetraploid as the somatic number of 14 is known for the sister genus *Gnaphalium* (Gustafsson, 1947; Urbanska, 1983, a and b.). Except for tetraploid chromosome number determinations for *A. eucoisma* and *A. howellii* which support previous counts for the species, all other determinations represent first reports and are presented without further comment. Tetraploid determinations previously reported for *A. eucoisma*, are also from Newfoundland populations (Morton, 1981; Urbanska, 1983). Thus, based on available determinations, this species is tetraploid throughout its distribution. The same is not true for *A. howellii* (= *A. neodioica*), as both aneuploid and euploid determinations have been previously reported (Stebbins, 1932b; Bayer and Stebbins, 1981, 1987; Bayer, 1984; Bayer and Crawford, 1986; Chinnappa, 1986; Chmielewski and Chinnappa, 1988, a and b, 1990). Tetraploid determinations for *A. howellii* occur throughout the more southern portion of the species distribution intermingled with other cytotypes (Bayer, 1984; Bayer and Stebbins, 1981, 1987; Bayer and

Crawford, 1986; Chinnappa, 1986). No other cytogeographic trends are recognizable for the species at this time.

Table 1.

Chromosome number determinations for 8 species of *Antennaria* from Newfoundland. Listed are species, chromosome number, location, date of collection and collection number. Staminate individuals are designated with an asterisk (*) following the collection number. All collections by J.G.Chmielewski.

A. cana Fernald, $2n = 56$. **Newfoundland:** District of St. Barbe North, Boat Harbour, July 13, 1993, 2973.

A. columnaris Fernald, $2n = 56$. **Newfoundland:** District of St. Barbe South, Pointe Riche Peninsula, Port au Choix National Historic Park, Gar gamelle Cove, July 16, 1993, 3007, 3008.

A. confusa Fernald, $2n = 56$. **Newfoundland:** District of Port au Port, Nfld 462, Port au Port, Table Mtn, July 6, 1993, 2963. District of St. Barbe North, Boat Harbour, July 13, 1993, 2974. Cape Norman region, July 13, 1993, 2977, 2979. Nfld 435, 0.5 km south of Cook's Harbour, July 13, 1993, 2981, 2986. East of Big Brook, July 13, 1993, 2989, 2990. District of St. Barbe South, Pointe Riche Peninsula, Port au Choix National Historic Park, vicinity of Pointe Riche, July 15, 1993, 3003.

A. eucosma Fernald & Wiegand, $2n = 56$. **Newfoundland:** District of Port au Port, Nfld 462, Port au Port, Table Mtn, July 6, 1993, 2967. District of St. Barbe North, Boat Harbour, July 13, 1993, 2971*. Cape Norman region, July 13, 1993, 2975*. Nfld 435, 0.5 km S of Cook's Harbour, July 13, 1993, 2987*. East of Big Brook, July 13, 1993, 2992*, 2993. District of White Bay North, Nfld 430, west of St. Anthony airport, July 15, 1993, 2994*, 2995.

A. gaspensis Fernald, $2n = 56$. **Newfoundland:** District of Port au Port, Nfld 462, Point au Mal, Ragged Ass road, July 5, 1993, 2959. Nfld 460, Lower Cove, July 5, 1993, 2961. District of St. Barbe South, Nfld 430, Table Point Ecological Reserve, north of Bellburns, July 16, 1993, 3011, 3013.

A. howellii Greene, $2n = 56$. **Newfoundland:** District of Grand Falls, Trans Canada Highway, 4.5 km west of Red Cliff Road, west of Grand Falls, July 23, 1993, 3020. District of Lewisporte, Nfld 331, 1.1 km east of Nfld 340, July 23, 1993, 3021, 3022. District of Placentia West, Nfld 210, 1.1 km south of Cow Head exit, Marystown area, July 26, 1993, 3031. District of Port au Port, Nfld 460, Lower Cove, July 5, 1993, 2960. Nfld 460, Cape St. George, July 5, 1993, 2962. Nfld 462, Port au Port, Table Mtn, July 6, 1993, 2970. District of St. Barbe South, south of Bellburns, July 16, 1993, 3015. Gros Morne National Park, just west

of Bear Cove, July 18, 1993, 3017. District of Twillingate, Nfld 340, 1.8 km south of Summerford, July 23, 1993, 3023. Nfld 340, 0.3 km south of Newville, July 23, 1993, 3024, 3025. Twillingate, summit of Smith's Lookout Road, July 23, 1993, 3028, 3029. Nfld 340, 0.3 km north of William B. Elliott Causeway, July 23, 1993, 3030.

A. pulvinata Greene, $2n = 56$. Newfoundland: District of St. Barbe South, Pointe Riche Peninsula, Port au Choix National Historic Park, vicinity of Pointe Riche, July 15, 1993, 2998, 3000, 3001. Gargamelle Cove, July 16, 1993, 3009.

A. straminea Fernald, $2n = 56$. **Newfoundland**: District of St. Barbe South, Pointe Riche Peninsula, Port au Choix National Historic Park, vicinity of Pointe Riche, July 15, 1993, 2997, 3002, 3004. Gargamelle Cove, July 16, 1993, 3010. Nfld 430, Table Point Ecological Reserve, N of Bellburns, July 16, 1993, 3012, 3014. S of Bellburns, July 16, 1993, 3016. Gros Morne National Park, Trout River Valley Road, Tableland Mtn., barren knob at mouth of Winter House Gorge, July 19, 1993, 3018, 3019. District of Twillingate, Twillingate, summit of Smith's Lookout Road, July 23, 1993, 3027.

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