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Cytogenetics of leafy spurge

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A greenhouse collection of 145 clones comprising 126 known accessions and 8 unknown or mislabeled accessions of the weedy *Euphorbia* species collected in Montana, Washington, Oregon, Idaho, Wyoming, Nevada, Colorado, North Dakota, Nebraska, Minnesota, Iowa, Michigan, Maryland, New Jersey, Pennsylvania, British Colombia, Alberta, Saskatchewan, Ontario, Austria, Hungary, Switzerland, Yugoslavia, and Italy has been established at Bozeman, Montana for cytogenetic analysis. The material was provided by weed supervisors, University personnel, and federal laboratories. Particular mention should be made of the generous contributions of the Plant Disease Laboratory at Frederick, Maryland; North Dakota State University at Fargo, North Dakota; the USDA Metabolism and Radiation Research Laboratory at Fargo; the Alberta Environmental Center at Vegreville, Alberta; and the Biosystematics Research Institute at Ottawa, Ontario.

A survey of the literature shows chromosome numbers for *E. esula* of 2n=16, 60, and 64; for *E. virgata* 2n=56; and for *E. cyparissias* 2n=20, 36, and 40. We found chromosome numbers of 2n=56 and 60 for *E. esula*, 2n=40 to ±80 for. *E. pseudovirgata*, and 2n=36, 40, and 42 for *E. cyparissias*. Our study of 614 cells in 94 plants revealed a high degree of somatic instability, mixoploidy, or mosaicism considered by some to be an indication for interspecific hybridization. The nature of such somatic instability was contributed by Nielsen and Nath (1961) to possible unbalanced nucleoprotein systems that resulted from the combination of distantly related gametes in the formation of such interspecific hybrids.

A map of accessions collected from Oregon, Washington, Montana, Wyoming, North Dakota, Alberta, and Saskatchewan shows that prevailing 2n chromosome numbers range from 52 in Flathead Co., Montana, to 64 in Teton Co. , Montana. Nearly all plants in this area exhibited some degree of somatic instability. This confirms earlier hypotheses (Croizat, 1945; Radcliffe-Smith, 1981) that this material originates from introgressive hybridization between two or more species, one of which is probably *E. esula*. This is also reflected in the composite idiograms of *E. esula* (2n=60) and *E. pseudovirgata* (2n=60), which show a resemblance of chromosome morphology in these species. Our morphological studies of leaf characteristics indicated that genetic material of *E. esula*, *E. virgata*, *E. cyparissias*, and *E. uralensis* can be suspected in this complex species group.

A map of prevailing chromosome numbers arranged according to states and provinces shows the greatest range in Montana (2n=52-64).

Five major types of nucleolus organizer chromosomes (I-V) were identified in this study. Confirmation of their existence was given through the study of the nucleoli formed by them. Preliminary counts showed from 1 to 6 nucleoli per cell with 33% having 5 nucleoli. Polymorphism was reflected in the number of nucleolus organizer chromosomes per plant. *E. pseudovirgata* showed all 5 nucleolus organizer chromosome types with an average of 3.3 pairs per cell, *E. esula* showed types I, II, IV, and V, with an average of 3.8 per cell, and *E. cyparissias* had types II and III with 2 pairs per cell.

Segmental allopolyploidy is suggested at the tetraploid and hexaploid chromosome levels as well, with genome formulas AABBCC for *E. pseudovirgata* (2n=60) and *E. esula* (2n=60), and AABB for *E. cyparissias*, with A, B, and C chromosomes resembling each other closely morphologically.

Meiosis in *E. pseudovirgata* was normal with only about 40% of the cells showing one univalent.

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