

Reprinted with permission from: *Proceedings of the 1984 Leafy Spurge Annual Meeting*. Dickinson, ND. June 27-28, 1984. pp. 2-3.

Published by: Great Plains Agricultural Council. Leafy Spurge Symposium.

Cytotaxonomic studies of the weedy *Euphorbia* species

J. R. SCHAEFFER and SHIRLEY GERHARDT

Department of Plant and Soil Science, Montana State University, Bozeman, MT 59717

A greenhouse collection of 82 ecotypes of the weedy *Euphorbia* species collected in Washington, Oregon, Nevada, Montana, Wyoming, North Dakota, Nebraska, Pennsylvania, New Jersey, Maryland, Canada, Austria, Hungary, Switzerland, and Italy has been established at Bozeman, Montana for cytogenetic analysis.

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. × pseudo-virgata*, and $2n=36$, 40, and 42 for *E. cyparissias*. Our study of 254 cells in 42 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 ecotypes collected from Montana, Washington, and Wyoming shows that average $2n$ chromosome numbers range from 53.3 in Flathead Co., Montana, to 61 in Sweetgrass 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. × pseudo-virgata* ($2n=60$) 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.

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. pseudo-virgata* 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. × pseudo-virgata* was normal with only about 40% of the cells showing one univalent.

Literature cited

Croizat, L. 1945. "*Euphorbia esula*" in North America. *Am. Midl. Nat.* 33:231-243.

Nielsen, E. L. and J. Nath. 1961. Somatic instability in derivatives from *Agroelymus turneri* resembling *Agropyron repens*. *Am. J. Bot.* 48:345-349.

Radcliffe-Smith, A. 1981. New combinations in the genus *Euphorbia*: III. *Kew Bull.* 36:216.