Cytogenetical Studies on Achene Colour Polymorphism of *Picris asplenoides* L. and *Urospermum picroides* L. (Asteraceae) in Egypt

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Abstract

Achene morphs of *Picris asplenoides* L. and *Urospermum picroides* L. were investigated in order to gain insight into its genetic variation based on the evidence obtained from karyotype analysis, electrophoretic pattern of achene proteins as well as nucleic acid analysis. In *Picris asplenoides* L., three achene morphs were observed from every inflorescence as follows: violet, brown and white, these morphs differ in their color. In the inflorescence of *Urospermum picroides* L., three achene morphs were differ also in their color were observed as follows: white, brown and black. All achene morphs of *Picris asplenoides* and *Urospermum picroides* were diploid, with ten chromosomes observed in somatic cells. Karyotype studies showed that the achene morphs of *Picris asplenoides* and *Urospermum picroides* have different karyotype formulae. However, the chromosome type nearly submetacentric (-) and nearly metacentric were common in all karyotype formulae of all different achene morphs of *Picris asplenoides* and *Urospermum picroides*. Not only the dissimilarity was found in the morphology of chromosomes but also in the Mean Chromosome Length (MCL) and Diploid Chromosome Length (DCL). Types and proportions of abnormalities for different achene morphs of *Picris asplenoides* and *Urospermum picroides* observed at mitotic division were analysed. The electrophoretic analysis of *Picris asplenoides* revealed the presence of fourteen bands of molecular weight ranging from 145.00 to 20.00 kD. The band with molecular weight 20.00 kD was restricted to brown achene from and can be used as molecular marker to distinguish brown achene form from violet achene form. The electrophoretic analysis of *Urospermum picroides* reveals the presence of nine bands of molecular weight ranging from 95.00 to 22.00 kD. The band with molecular weight 22.25 kD was restricted to white achene from and can be used as molecular marker to distinguish white achene form other achene forms. The nuclear DNA content for *Picris asplenoides* were 0.0295 and 0.0183 μg g^{-1} fresh weight for violet and brown achene, respectively, while RNA content were 25.347 and 35.069 μg g^{-1} fresh weight for violet and brown achene, respectively. The nuclear DNA content for *Urospermum*

picroides were 0.093, 0.115 and 0.145 μg g^{-1} fresh weight for brown, black and white achene, respectively while RNA content were 10.417, 17.361 and 21.528 μg g^{-1} fresh weight for black, white and brown achene, respectively.

Key words: *Picris asplenoides*, *Urospermum picroides,* achene color polymorphism, karyotypes, protein profile, nucleic acids

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REFERENCES

1. Abraham, Z. and P.N. Prasad, 1983. A system of chromosome classification and nomenclature. Cytologia, 48: 95-101.
2. Boulos, L., 1995. Flora of Egypt, Checklist. 1st Edn., Al-Hadara Publishing, Cairo, Egypt.
3. Bradford, M.M., 1976. A rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. Anal. Biochem., 72: 248-254.
4. Bremer, K., 1994. Asteraceae: Cladistics and Classification. Timber Press, Portland, Oregon, ISBN-10: 0881922757.
5. Brullo, S. G. Majorana, P. Pavone and M.C. Terrasi, 1977. Numeri cromosomici per la flora Italiana. Inform. Bot. Ital., 9: 40-55.
6. Burton, K., 1968. A study of the condition and mechanism of the diphenylamine reaction for the colourimetric estimation of DNA. Biochem. J., 62: 315-323.
7. Chattopadhyay, D. and A.K. Sharma, 1988. A new technique for orcein banding with acid treatment. Stain Technol., 63: 283-287.
8. Dische, Z., 1962. Color Reactions of Pentoses. In: Methods in Carbohydrates Chemistry, Whistler, R.L. and M.L. Wolfrom (Eds.). Academic Press, New York, pp: 484-488.
9. Dolezel, J., J. Greihuber, S. Lucretti, A. Meister, M.A. Lysak, L. Nardi and R. Obermayer, 1998. Plant genome size estimation by flow cytometry: Interlaboratory comparison. Ann. Bot., 82: 17-26.
10. Ellner, S. and A. Shmida, 1984. Seed dimorphism in relation to habitat in genus *Picris* (Compositae) in Mediterranean and Arid regions. Isr. J. Bot., 33: 25-39.

11. Greilhuber, J. and F. Septa, 1976. C-banded karyotypes in the *Scilla hohenackeri* group. *S. persica* and *Puschkinia* (Liliaceae). Plant Syst. Evol., 126: 149-188.
12. Harper, J.L., 1997. The Population Biology of Plants. Academic Press, London.
13. Huziwara, Y., 1962. Karyotypic analysis in some genera of compositae, VIII. Further studies on the chromosomes of *Aster*. Amer. J. Bot., 49: 116-119.
14. Imbert, E., J. Escarre and T.J. Lepar, 1996. Achene dimorphism and among-population variations in some biological traits in *Crepis sancta* (Asteraceae). Int. J. Plant Sci., 157: 309-315.
15. Kamel, E.A., 1999. Karyological studies on some taxa of the Asteraceae in Egypt. Comp. News I., 33: 1-18.
16. Koller, D. and N. Roth, 1964. Studies of the ecological and physiological significance of amphicarpy in G*ymnarrhena micrantha* (Compositae). Am. J. Bot., 51: 26-35.
17. Kuzmanov, B. and P. Jurukova, 1977. In IOPB chromosome number reports LV III. Taxon, 26: 557-565.
18. Laemmli, U.K., 1970. Cleavage of structural proteins during the assembly of the head of bacteriophage T_4. Nature, 227: 680-685.
19. Loeve, A. and E. Kjellqvist, 1974. Cytotaxonomy of Spanish plants. IV. Dicotyledonous: Caesalpiniaceous- Asteraceae- Lagascalia, 4: 153-211.
20. Mc-Evoy, P.B., 1984. Dormancy and dispersal in dimorphic achenes of Tansy ragwort, *Senecio jacobaea*. Oecologia, 61: 160-168.
21. Morton, J.K., 1977. A cytological study of the compositae (Excluding *Hieracium* and *Taraxacum*) of the British isles. Watsonia, 11: 211-223. Nazorva, E.A., 1975. Chromosome numbers of some species of armenian flora. Biol. Zurn Arm., 1: 95-97.
22. Nevo, E., B. Baum, A. Beiles and D.N. Johnson, 1998. Ecological correlates of RAPD DNA diversity of wild barley, *Hordeum spontaneum*, in the fertile crescent. Genet. Resour. Crop Evol., 45: 151-159.
23. Reeves, A., 2001. Micro measure: A new computer program for the collection and analysis of cytogenetic data. Genome, 4: 439-443.
24. Schmitt, J., D. Ehrhardt and D. Swartz, 1985. Differential dispersal of self fertilized and outcrossed progeny in jewelweed *(Impatiens capensis)*. Am. Nat., 126: 570-575.

25. Schnee, B.K. and D.M. Walter, 1986. Reproductive behaviour of *Amphicarpaea bracteata* (Leguminosae), an amphicarpic annual. Am. J. Bot., 73: 376-387.
26. Schoen, D.J. and D.G. Lioyd, 1984. The selection of cleistogamy and heteromorphic diasporas. Biol. J. Linn. Soc., 23: 303-322.
27. Shibko, S., P. Koivistoven, C.A. Tratnyek, A.R. Newhall and L. Friedman, 1967. Method for sequential quantitative separation and determination of protein, RNA, DNA, lipid and glycogen from a single liver homogenate or from subcellular fraction. Annal. Biochem., 19: 415-528.
28. Sorensen, A.E., 1978. Somatic polymorphism and seed dispersal. Nature, 276: 174-176.
29. Tanowitz, B.D., P.F. Salopek and B.E. Mahall, 1987. Differential germination of ray and disk achenes in *Hemizonia increscens* (Asteraceae). Am. J. Bot., 74: 303-312.
30. Telenius, A. and P. Torstensson, 1989. The seed dimorphism of *Spergularia marian* in relation to dispersal by wind and water. Oecologia, 80: 206-210.
31. Tackholm, V., 1974. Student's Flora of Egypt. Cairo University Press, Cairo, Egypt.
32. Venable, D.L. and D.A. Levin, 1985. Ecology of achene dimorphism in *Heterotheca latifolia*: I. Achene structure, germination and dispersal. J. Ecol., 73: 133-145.
33. Venable, D.L. and L. Lawlor, 1980. Delayed germination and dispersal in desert annuals: Escape in space and time. Oecologia, 46: 272-282. Venable, D.L., 1985. The evolutionary ecology of seed heteromorphism. Am. Nat., 126: 577-595.
34. Walter, D.M., 1984. Differences in fitness between seedlings derived from cleistogamous and chastogamous flowers in *Impatiens capensis*. Evolution, 38: 427-440.
35. Zarco, C.R., 1986. A new method for estimating karyotype asymmetry. Taxon, 35: 526-530.
36. Zohary, M., 1950. Evolutionary trends in the fruiting heads of compositae. Evolution, 4: 1403-1409.