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Morphological differences of haploid, diploid and tetraploid Purple cornflower (*Echinacea purpurea* L.) produced by *in vitro* conditions

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Echinacea purpurea L. (Purple cornflower) is one of the most important medicinal herb belongs to family Astraea. Three morphologically different types of roots of plantlets could be identified clearly even in *in vitro* conditions. Although all the rooted plants were almost the same height and possessed of almost the same number of leaves, diploid and tetraploid were showed obviously sturdier roots while haploids with slimmer roots. Roots of diploids and tetraploids showed prominent difference; in the roots of tetraploids were shorter, thicker, darker coloured and with many lateral roots than those of diploids. The difference in the thickness of the roots could be distinguished as early as on day 10-15, a few days after growing out of adventitious roots. There were no significant differences in flowering time between haploid, diploid and tetraploids grew normally in the field and flowered within 5 months.

There was no prominent morphologically different of *E. purpurea* haploid, diploid and tetraploid plant leaves could be identified clearly even in *in vitro* or *in vivo*. Size of stomata on leaves varied largely even among those of the same leaf, but statistically significant mean size differences could be found between those of haploid, diploid and tetraploid. The average length of the stomata of diploid plants was 104.519 μm , while it was in those tetraploid plants and haploid plants were 144.810 μm and 72.41 μm respectively; thus significantly longer than those of the haploid plants. Over all, tetraploids possessed longer and wider stomata.

E. purpurea haploid has 11 chromosomes with smaller cells; a diploid has 22 chromosomes; a tetraploid has 44 of chromosomes with comparatively larger cells.

Keywords: *E. purpurea*, tetraploid, diploid, haploid