

## Shifts of maize crop weed flora over 50 years: a case study in central Italy

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During the second half of the twentieth century, agricultural practices in Italy underwent a fast transition from extensive and traditional to intensive and specialized. Weed assemblages colonizing cultivated fields were thus subjected to major shifts, mainly driven by the increased use of herbicides and chemical fertilizers. Moved by the early intuition that the fight against weeds could deeply alter the balances of arable agroecosystems, already in the 1960s' several phytosociological surveys were carried out on maize weed communities of many Italian regions (1, 2, 3, 4, 5). Based on the study carried out in 1964 (4) on 21 maize fields across Latium (central Italy), we re-surveyed weed communities in as many fields, in the same localities, and in the same period of the year, to highlight the changes that agricultural intensification induced in their features. The agricultural practices lately introduced are irrigation, chemical weeding, and chemical fertilization.

Floristic diversity underwent a relevant decrease from 1964 to 2017, as the number of detected species dropped from 99 to 69, consistently with the current common use of herbicides. Besides, a major species turnover was highlighted: by 2017, 71 taxa had disappeared from fields and new 41 had appeared. Out of a total amount of 130 species, only 28 were present both in old and new relevés; the latter are essentially represented by generalist taxa as *Convolvulus arvensis* L., *Cynodon dactylon* (L.) Pers., and *Solanum nigrum* L. The most represented families are Poaceae, Asteraceae, and Fabaceae in both the surveys; a decrease of Asteraceae and Brassicaceae and an increase of Euphorbiaceae and Solanaceae was detected.

Many alien taxa, mostly American, appeared in 2017, suggesting how intensive agriculture can enhance biological invasions. Particularly relevant are the rates of occurrence of the invasive neophytes *Paspalum distichum* L. and *Datura stramonium* L. (36.4% and 31.8% of the relevés, respectively), followed by those of the archaeophyte *Abutilon theophrasti* Medik. (27.3%) and of the neophyte *Xanthium italicum* Moretti (18.2%). Other newly appearing invasive neophytes are *Euphorbia maculata* L., *E. prostrata* Aiton, and *Amaranthus blitoides* S.Watson. There was also a casual presence of several cultivated species deriving from previous or surrounding cultivations. Many taxa typically related to winter arable land were common in 1964, but had disappeared by 2017. Between these, there are *Lolium temulentum* L., *Lysimachia arvensis* (L.) U.Manns & Anderb., *Anthemis arvensis* L., *Phalaris brachystachys* Link, *Legousia speculum-veneris* (L.) Chaix, and *Centaurea cyanus* L.; their disappearance is to be related to the current absence of crop rotations and to their sensitivity to fertilized soils. Very relevant was the increase in frequency of *Sorghum halepense* (L.) Pers. (from 4.8 to 54.5%) and *Cyperus rotundus* L. (from 14.3 to 50%); these monocots are often resistant to herbicides (6) and, as rhizomatous geophytes, their propagation is favoured by ploughing.

The comparison of chorological spectra shows how Eurimediterranean species are the predominant ones in both the years, though a slight decrease in their occurrence is detectable in 2017. Cosmopolitan taxa highly increased, becoming the second most important chorotype instead of alien taxa, which became the third. The disappearance of Stenomediterranean taxa is linkable to the spread of irrigation practices and the consequent artificial elimination of drought conditions.

The similarity between the two life forms spectra points out how species were replaced by others with similar life strategies, as already detected in Latium for wheat weeds (7). The slight decrease in Therophytes is consistent with the disappearance of Stenomediterranean taxa, while the higher occurrence of Geophytes can be related to an increased intensity of ploughing.

The increase in C4 plants (such as Panicoideae, *Sorghum* sp. pl., *Cyperus rotundus*, *Amaranthus* sp. pl., *Euphorbia* sect. *Chamaesyce* - from 18.1 to 39.1%, frequency-weighted values), as maize itself is, suggests that more specialized agricultural practices favour weeds being physiologically closer to the cultivated species.

1) G.G. Lorenzoni (1962) *Maydica*, 8, 35-45

2) G.G. Lorenzoni (1963) *Quad. 2° di Maydica*, 8, 1-54

3) G.G. Lorenzoni (1965) *Quad. 5° di Maydica*, 10, 1-46

4) G.G. Lorenzoni (1967) *Quad. 7° di Maydica*, 12, 3-24

5) G.G. Lorenzoni (1968) *Quad. 9° di Maydica*, 13, 1-22

6) M. Horowitz (1972) *Weed Res*, 12(1), 11-20

7) G. Abbate, E. Cicinelli, D. Iamónico, M. Iberite (2013) *Ann Bot (Roma)*, 3, 97-105