

Long-term changes in the flora of the cereal ecosystem on the Sussex Downs, England, focusing on the years 1968 -2005.

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ABSTRACT

1. There has been a surge of interest in the effects of modern agriculture on biodiversity but studies of farmland flora have lacked continuity and historical context. Here we present the results of 38 years of annual monitoring of the weed flora of cereal crops on the Sussex Downs.
2. This study investigates the long-term changes in abundance of 214 weed species, two subspecies and one forma found in the cereal fields of a 62-km² area of the Sussex Downs. Species occurrence and weed abundance were recorded annually in June from 1970 to 2005 inclusive. Stubbles were surveyed in 1968, 1971, 2004 and 2005.
3. Annual archaeophytes and perennial natives predominated and the community belonged to the *Papaver rhoeas*–*Silene noctiflora* association (OVI 6) of the UK National Vegetation Classification.
4. Overall, 97% of fields were treated with herbicides prior to sampling, reducing dicotyledonous weed abundance by 64% and taxon occurrence by 52%. From 1970 to 2005 there was no trend in overall abundance of dicotyledons, although monocotyledons decreased by 13% relative to the early 1970s.
5. Of 66 taxa monitored from 1970 to 2005, 18 increased, 38 rose and fell (or vice versa) and 10 showed no trend. Annuals increased until the early 1980s, when many were not susceptible to herbicides, before levelling off or declining slightly as the efficacy of herbicides expanded.
6. Perennial dicotyledons increased steadily throughout the study. This latter change was due to the loss of traditional leys, not to changes in herbicide efficacy.
7. Ninety-two species of dicotyledons were found on stubbles, with no significant overall change in occurrence from 1968–1971 to 2004–2005. In both stubbles and crops, species uncommon at the start have tended to increase whereas common species have tended to decrease.
8. Combining this study with earlier records, we estimate that 16 weed species have been lost from the study area and 15 gained. Before 1970, the loss rate of archaeophytes and the gain rate of neophytes were both higher than for other species. Most species lost were historically uncommon whereas many of the species gained are now common.
9. *Synthesis and applications.* The soil seed bank remains sufficient to enable a rapid restoration of the pre-herbicide flora where needed for wildlife conservation purposes, without 'enhancement', i.e. seeding. The means to do this are available through the UK's agri-environment 'in-field measures', but these are very unpopular with farmers. Incentives need to be much improved to ensure the future conservation of the traditional arable flora.

Citation

Potts, G.R., Ewald, J.A. & Aebischer, N.J. (2010). Long-term changes in the flora of the cereal ecosystem on the Sussex Downs, England, focusing on the years 1968-2005. *Journal of Applied Ecology*, 47: 215-226.