

Populations: diversity in plant breeding



The Organic Research Centre has pioneered an evolutionary breeding programme to produce a hugely diverse population of wheat suited to organic and low-input farming systems. This year, for the first time, we are marketing it as *ORC Wakelyns Population*.

Breeding for organic/ low-input systems

Successful organic crop production requires varieties that are resistant to diseases, competitive against weeds, and effective at scavenging nutrients. Yet conventional plant breeding has largely neglected organic systems by breeding varieties exclusively for high input conditions. As a consequence, organic producers currently do not have enough choice of plant varieties for organic conditions.

One way to expand the choice is to create plant diversity anew and subject it to natural selection on organic farms. After several generations the dominating plants would be better suited to organic systems.

Why diversity?

There are positive correlations between diversity and stability and between diversity and productivity. We need diversity simultaneously in our systems through rotations, integration of crops and livestock and inter-cropping. We also need it within crops, which can be through mixtures of varieties or by using populations.

Climate change and unpredictable performance of cereal crops in farming is of increasing concern.

This is aggravated by an almost universal use in both conventional and organic agriculture of monocultural pureline varieties. These have developed for convenience of drilling, harvesting and marketing, but are also tied into corporate sales of varieties and inputs, loss of diversity and increased fossil fuel usage. We need a new genetic approach which is dynamic in providing crops that are able to adapt to variable environmental stress.

What is a population?

Populations are genetically diverse. All plants are genetically distinct while all of those in standard pureline varieties are almost identical. This means that populations are better able to adapt to unpredictable environments.

Buffering effect

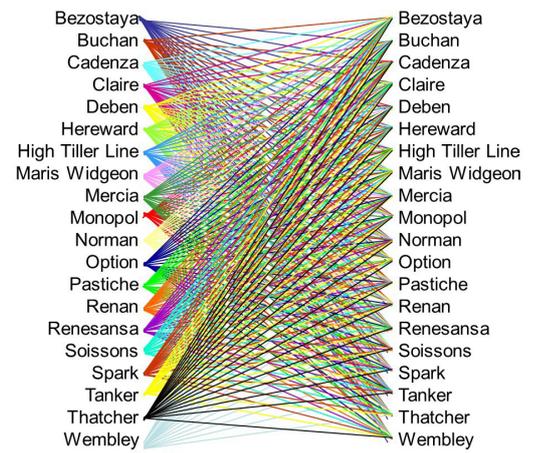
The diversity (both genetic and physical variation) within a population means that it has the **capacity** to cope with variable environments; this variation means that the different individuals in a population can **complement** each other – one tall, one short etc - but also **compensate** - if one fails there are others to take its place. We would also expect the populations to gradually **change** and adapt to the conditions of organic crop management and to the farms on which they are grown – although this will be a long process.

ORC Wakelyns Population

ORC has been working on these Composite Cross Populations of wheat since 2001/02.

We have developed an evolutionary breeding programme to produce a hugely diverse population of wheat suited to organic and low-input farming systems. It was bred by making 190 crosses among 20 different parent varieties and mixing all the resulting seed. This has now been through eleven generations of natural field selection, including at Wakelyns Agroforestry in Suffolk.

Increased genetic diversity makes more efficient use of soil nutrients and water, lowers plant disease and pest levels and thus improves yield stability of wheat. Moreover, our choice of parents has produced a population which combines attractive levels of both **yield AND quality**.



The 20 parents and over 190 crosses that make up the population

Ready to market

Up to now, it has been illegal to market such populations because they do not conform to EU law which currently ensures monocultural uniformity. From trials completed over the last decade we have been able to convince EU officials that the benefits of the population approach should be evaluated through test marketing at the European level.

As a result, in March 2014 the EU law was changed to allow a trial period for marketing 'varieties' (populations) that do not fit the normal rules and regulations.

Qualities of ORC Wakelyns Population

- Greater yield stability than its parent varieties
- Protein content and hardness were significantly increased
- Baking quality
- As nutritious as parent varieties
- Suitable as an animal feed



Where to buy ORC Wakelyns Population?

Contact: Andrew Cooper, Walnes Seeds

<http://www.walnesseeds.com/>

Please support our work! While much of what we do is funded as projects by the EU, governments and charitable foundations, many of our activities depend on voluntary donations from the public – *people like you!* **Donate online** or send your contribution to the address below.

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