Organic Seeds for Organic Growers

An event organised by the OGA and Peter Brinch of Open Pollinated Seeds, 16th April 2012
Held at Tolhurst Organics, Whitchurch-on-Thames

Notes by Louisa Winkler

Background

In 2011, an Organic Growers' Alliance survey found that organic growers were dissatisfied with the quality and range of seed available to them. The Open Pollinated Seeds workshop aimed to re-empower growers to take a more active role in the seed supply chain. It introduced growers to the differences between commercially dominant hybrid breeding approaches and the open-pollinated breeding approach, exploring the issues associated with each and introducing the methods by which growers and farmers can breed and harvest their own seed.

The workshop was led by Peter Brinch, a strong advocate of open-pollinated seed breeding on the grounds of biodiversity, locally adapted cultivars and sovereignty over genetic resources. Peter strongly encourages growers to reconnect with and get to know the reproductive phase of their plants' life cycles.

Peter began the workshop by talking about the disconnect which has emerged in the developed world between crop production and reproduction, pointing out that generally, each of these stages is carried out separately by specialist actors in the supply chain. Growers now obtain most of their seed through merchants from breeding companies, among whom hybrid breeding has become increasingly popular. F1 hybrids discourage on-farm seed saving due to segregation in the F2 generation and the accompanying deterioration in quality. The seed companies must maintain the progenitors of the hybrid lines as open-pollinated in-bred populations, but are not obliged to make them publicly available in genebanks. This makes them keepers of rich and unique genetic resources, embodied in the hybrid lines.

These resources can be 'unlocked' through the process of dehybridisation: hybrid lines are intercrossed or self-pollinated in the F1 generation and the diversified offspring are grown out to select for further lines. Thus, the lines are returned to an open-pollinated state. Some experts maintain that the process can produce high-yielding cultivars within a few generations, and several organisations such as Sativa in Switzerland are now carrying out dehybridisation programmes in the interests of seed sovereignty (ref. Horneburg, B., *Organic Plant Breeding: Achievements, Opportunities and Challenges*). Seed companies are unlikely to be very supportive of dehybridisation, since it is effectively a form of competition.

Currently, hybrid varieties dominate the seed market. Among open-pollinated varieties available, only a minority are available in organic quality. Peter is among many experts believing that open-pollinated breeding can generate cultivars of a quality as high as if not higher than hybridised cultivars.

Following the introductory discussion, Peter moved on to address the methodologies of plant breeding and seed production. Below is a selection of the technical points which came up.

Technicalities in plant breeding and seed saving

- Isolation of the breeding population is crucial, either with a physical barrier or by ensuring that no conspecifics are present within pollination distance (which will depend upon whether the plant is wind- or insect-pollinated). Some plants have commonly-occurring wild relatives with which they will intercross. Growers producing carrot seed, for example, must ensure that wild carrot (Queen Anne's Lace) does not grow within 1km of their seed production beds.

- Out-crossing species always require a minimum population size to avoid inbreeding depression and a genetic bottleneck. This minimum size, however, varies quite considerably between species. Carrots require 25-30 individuals for healthy offspring, sweet corn over 200, and onions and leeks around 3,000.

- Breeders may employ a positive or a negative selection method. In positive selection, the breeder identifies a small subset of the parent generation (respecting the minimum size requirement to avoid inbreeding depression) as the best performers and allows only these individuals to intercross and set seed. A practical example of a positive selection programme would be to grow 3,000 onion plants in the first generation, select 5-10 percent of them, save the seed and grow another 3,000 in the second generation, continuing for as many generations as required to develop a consistently high-performing line. In negative selection, a subset of the breeding population is identified as the worst performers and rogued out, allowing the remaining plants to intercross and set seed.

- Positive selection narrows down the gene-pool more quickly than does negative selection and produces more homogenous populations. This generates what is known as Elite Seed or Breeder Seed, and is the approach which should be used to produce a breeding line. The (non-hybrid) seed sold to most growers is Standard Seed, produced by negative selection and therefore not completely true to type but adequate as a crop.

- Taste can be included as a selection criterion for many plant types. Even in root vegetables, a small sliver can be cut out and the cut sealed with wood ash before re-planting.

- In seed production, space-saving techniques are important for many growers, as space is a precious commodity on the farm. For some crops, the breeding parents can be dug up and transferred to a more compact seed-production bed; this is particularly relevant when employing positive selection as the breeding population will only be 5-15 percent of the total parent generation. Even mature brassica plants can be translocated as long as plenty of soil is left on the roots.

- A single plot of soil should not be used for seed production more than once every three to four years.

Economics and the seed industry

Seed is not a major cost category for most organic farmers and growers, and even experienced seed-savers find that they are barely able to justify the resource requirements of on-farm selection and seed-saving.

There are, however, opportunities to generate income by selling saved seed which Peter highlighted. He estimates that carrot seed can generate £6-7 per square meter, and cabbages £30-40.

Most of the familiar UK seed companies undertake none of their own growing or selection and simply act as merchants, with much of the seed coming from abroad. Some of these companies (Tamar Organics and Chase Organics, for example) are reportedly interested in selling more locally-produced organic seed, and represent a market for aspiring seed-producers. Growers unable to invest in expensive equipment for processing seed (threshing, dressing and cleaning; a seed thresher costs around £3,000 second hand) are able to sell un-threshed seed for a lower margin. Stormy Hall offers a seed-processing service.

The potential exists, therefore, for the expansion of UK-grown organic seed resources.

Legislation

Any commercially available cultivar may be used in on-farm breeding to produce seed for on-farm crops. While these crops can be sold, however, the seed cannot. Plant breeders have rights over their registered varieties for 25 years; only after this do they become a Free Variety available for the commercial production of seed. Marketing seed from a younger (even an open-pollinated) variety necessitates obtaining the breeder's agreement and then paying royalties.

Plant breeders have good reason for jealously guarding their products: for a biennial species, it can take 14 years from the initial selection to produce a high-performing line that passes DUS (Distinctiveness, Uniformity and Stability) criteria as necessary for registration.

Obstacles

Obstacles remain to the expansion of on-farm breeding and seed-saving activities, including the following:

- Attaining varietal consistency (growers deal with such low profit margins that every plant on the farm must be made to count).
- Time requirements of selection and seed-saving activities.
- Economics (seed is not one of the farm's biggest cost categories, and saving one's own seed takes up time and space).
- Choosing the right selection criteria. It may not be obvious to growers what traits to prioritise in a selection programme, leading to time wastage if the varieties produced are not marketable.