

Hybrid Crops Factsheet

Growing Hybrid Crops

Crops produced from F1 hybrid seed offer growers significant benefits in terms of yield improvement, agronomic performance and consistency of end-use quality. This is due to the 'hybrid vigour' derived in a single season by combining two carefully selected parent lines. Attempting to farm-save hybrid varieties will result in segregated populations that produce highly variable offspring, which can lead to reduced yield, disease resistance and quality. Therefore, this practice makes no economic or agronomic sense to carry out.



Introduction

Hybrid crops are derived from established and well-proven breeding methods used in the agriculture and horticulture sectors. Since their introduction nearly 100 years ago; hybrid crops have come to dominate commercial production in many important crop species.

In the UK, for example, barley, sugar beet, forage maize, oil-seed rape and many vegetable crops are all grown from F1 hybrid seed.

The development of hybrid crops has been one of the major factors behind a dramatic increase in global crops yields. Such improvement is achieved through the selective and controlled breeding of two inbred parent lines, which upon crossing delivers heterosis, or 'hybrid vigour'. This boost in performance, combining the best yield, quality and agronomic characters from each parent, is the result of hybrid breeding.

Hybrid Seed Production

Genetically uniform inbred parent lines are carefully selected by the breeder over several years of trials to identify the best combination of genetics in the hybrid variety. By creating male sterility in one parent (female line; producing no pollen), it is then fertilised by the pollen of the other parent (male line) when the two lines are grown together, under carefully controlled conditions.

Before this hybrid can be marketed, the seed is entered into official Value for Cultivation and Use (VCU) trials, which are statutory, independently run, multi-site tests designed to confirm that the variety delivers real agricultural benefit. These trials, carried out by accredited centres under APHA approved protocols, evaluate whether the hybrid shows improvements over existing varieties in traits such as yield, standing power, disease resistance, quality characteristics and overall agronomic performance. Multiple sites and seasons are used to ensure robust, reliable data. The results are reviewed by expert committees, including the VCU Technical Experts Group and the National List Seeds Committee, before a variety can be accepted onto the GB Variety List and progress to Recommended List testing.

Commercial seed production of F1 hybrid oilseed rape

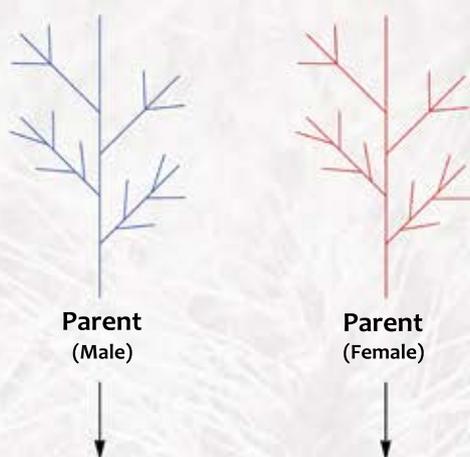
All seed harvested from the Male Sterile line will be F1 hybrid seed.

Male
(pollinator)

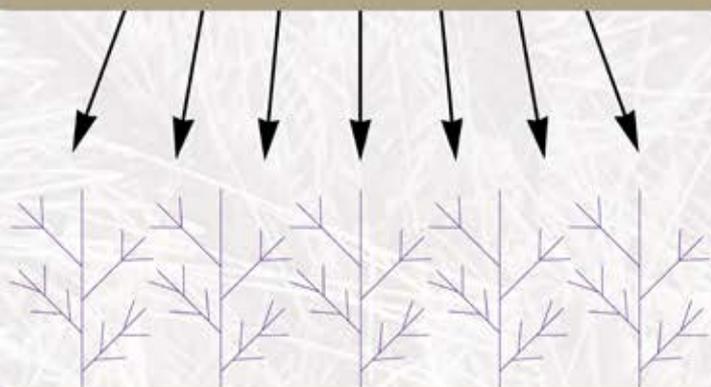
Female
(male-sterile)

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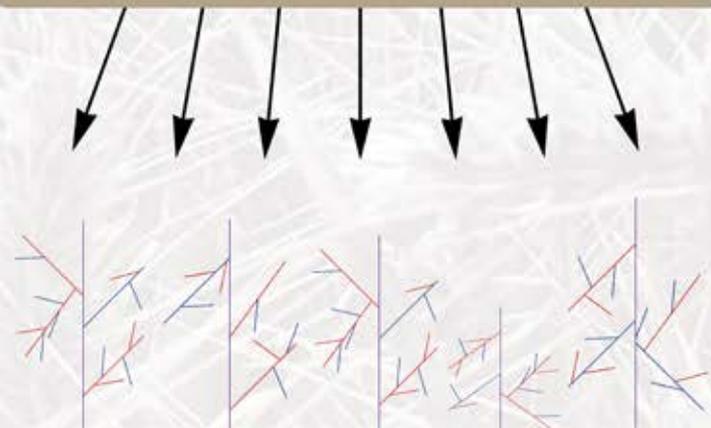
F1 hybrid seed is produced by crossing carefully selected male and female parent lines



F1 hybrid seed delivers 'hybrid vigour' in the resulting crops.



If farm-saved, hybrid crops segregate and produce highly variable offspring.



"Hybrid (F1) varieties are produced by crossing two genetically distinct, inbred parent lines, resulting in high heterozygosity and heterosis (hybrid vigour). This heterosis is agronomically expressed as increased yield, greater uniformity, and improved stress tolerance.

However, when hybrid seed is farm-saved and replanted, the resulting F2 population segregates into genetically diverse individuals. Unlike the uniform F1 hybrid, most F2 individuals lose the favourable parental allelic combinations responsible for heterosis, leading to reduced yield and overall poorer agronomic performance".



Dr. Noam Chayut
Head of Germplasm Resources Unit
at John Innes Centre

Farm-Saved Seed

If a hybrid crop was grown on again as farm-saved seed, it would lose heterosis and be prevented from performing similarly to the hybrid parent, due to genetic regression and segregation. For these reasons, farm-saving hybrid crops is never recommended.

It can be expected that any resulting crops will segregate and produce variable offspring, reducing yields and lose their agronomic characters. For example, an oil-seed rape hybrid with canker-resistance, that has been intentionally inherited from one of the parent lines, could lose that resistance when grown on as farm-saved seed.

New Quality Standards

Because F1 hybrids have been deliberately created to express superior performance, VCU trials validate that this hybrid vigour actually translates to measurable, farm-level benefit across environments and seasons.

The selection and seed-production process for F1 hybrids is expensive, but the performance in yield and other key characteristics, demonstrated through VCU testing compensates for the extra cost. Because this hybridisation system does not readily occur in nature, the production of hybrid seed by a professional seed producer must be undertaken each season.

The British Society of Plant Breeders (BSPB) is the representative body for the UK plant breeding industry. Acting on members' behalf, BSPB licenses, collects and distributes certified seed royalties and farm-saved seed payments on agricultural and horticultural crops. The Society represents members' interests on technical, regulatory and intellectual property matters, and works to promote continued innovation and investment in UK plant breeding.