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USE OF THE PARENTAL FORMULA FOR EXAMINING DISTINCTNESS IN HYBRIDS

Document prepared by experts from France

DRAFT DOCUMENT (for TGP 9)**9.4 Use of Parental Formula for Examining Distinctness in Hybrids**

In the Test Guidelines for certain species (maize, sunflower, oilseed rape), an optional method is described to assess distinctness of a hybrid variety with a prescreening approach based on the parental components of the hybrid and its formula.

The method includes four main steps which are:

1. Description of parental lines according to the Test Guidelines of the given species.
2. Check of the originality of these parental lines in comparison with the reference collection, based on the characteristics in Chapter VII in order to screen the closest inbred lines.
3. Check of the originality of the hybrid formula in comparison with those of the hybrids of common knowledge, taking into account the closest inbred lines.
4. Assessment of the distinctness at the hybrid level of varieties with similar formula.

The basic principle of the method is that two inbred lines A and B used in two different crosses $A \times C$ and $B \times C$ will give two different hybrids according to the UPOV rules as soon as the difference between A and B is important enough and clearly qualified.

The aim of the paper is to describe how to use this method.

Before that, it is important to underline the main reasons for developing such a method and under which conditions it can be used

The main interest lies in the fact that :

- Breeders working on hybrid programs are focusing their attention on the inbred lines to obtain a good general and specific combining ability.
- An inbred line with a good genetic value is generally used in many different hybrid varieties. It means that the DUS test done on an inbred line can be used for all these different hybrid varieties.
- For different species, the knowledge of the genetic control of some characteristics makes it possible to check the correctness of the formula declared by the applicant. So a clear link can be established between the hybrid variety and the parental lines.
- DUS test on inbred lines, which are generally highly homozygous and therefore uniform, is easier compared to a DUS test on a three way, or double cross, hybrid which must be assessed plant by plant.
- The management of the reference collection is more efficient because relatively few hybrids have to be sown each year.
- Most of the lines are the subject of an application for plant breeders' rights and therefore need to be studied for DUS.

The use of this method requires:

- a compulsory declaration of the formula and a compulsory delivery of the plant material of the components (inbred line and intermediate hybrids).

- the management of a reference collection of the inbred lines, used as parents in the hybrid varieties of common knowledge, and a list of the formulae concerning these varieties.
- a consistent application of this method for all varieties of given species. This condition is important to obtain full benefit of it.
- a rigorous approach to assess the originality of any new inbred line in order to be confident on the distinctness of the hybrid variety resulting from it.

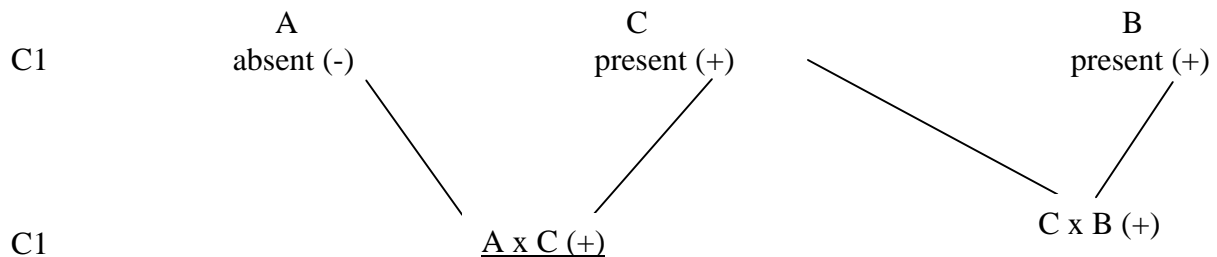
A rigorous approach to assess the originality of a new inbred line.

The basis for establishing the originality is the list of characteristics described in the Test Guidelines of the species concerned.

The difference between lines must be sufficient to be sure that the hybrids are distinct.

The following example illustrates this point :

If the two levels of expression of a characteristic (absent/present) are determined by two alleles (+, -) of one gene, with a one dominant allele (+), the following situation can appear :



Although these two lines are clearly different for this characteristic (C1), the two hybrid varieties are not different. So in this case it means that a difference between A and B on one characteristic is not enough.

If we consider characteristics with a more complex genetic control involving several genes not precisely identified, the interaction between the different alleles of each gene and between genes can also lead to similar expression at the level of the hybrid varieties. In such a case, it is, in general, appropriate to require a larger difference than the regular minimum distance required to establish distinctness between two inbred lines.

The establishment of the minimum distances is mainly based on a good knowledge of the species, of its characteristics and, when available, of their genetic control.

Such approaches have been developed for different species in France using a software with which the closest lines can be detected using combinations of characteristics with consideration of their variability within the species ; their susceptibility to environmental effect and their reliability.

Using such a method to study DUS of a hybrid variety, other conditions have to be fulfilled :

- Check of the validity of the formula : the aim is to check if the candidate hybrid variety has actually been produced by crossing the declared parental lines as submitted by the applicant.

Different characteristics can be used to perform this check as soon as the genetic pattern of each parent can be identified in the hybrid.

In general, characteristics based on polymorphism of enzymes or of some storage proteins can be used.

If no appropriate characteristic is available, the only possibility is to cross the parental lines using the plant material delivered by the applicant and to compare the hybrid variety seed lots (the sample delivered by the applicant and the sample harvested after the cross).

- Check of uniformity and stability of each of the parental lines.

These two criteria represent an important condition to achieve stability of the hybrid. Another criteria is the use of the same formula at each cycle of the hybrid seed production.

To assess uniformity and stability of the parental lines, the UPOV recommendations on this type of variety must be followed.

A check of the uniformity on the hybrid seed lot must also be done even if there is no need to assess distinctness at the hybrid level.

- Description of the hybrid.

Where the assessment of distinctness is based only on the parental lines, a description of the candidate hybrid must be established.

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