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**THE USE OF ELECTROPHORETIC CHARACTERISTICS IN DUS TESTING OF  
RYEGRASS**

*Document prepared by the experts from the Netherlands*

## THE USE OF ELECTROPHORETIC CHARACTERISTICS IN DUS TESTING OF RYEGRASS

### Summary

Taking into account the formal and technical rules of the UPOV system electrophoretic characteristics should generally be used as independent characteristics on its own. Problems of minimum distance, piracy and cosmetic breeding do not belong to the responsibility of the granting authority. The owner of the breeders' right has by the provision of essential derivation sufficient means to act against these kind of "infringements". Due to the workload involved with electrophoresis, these characteristics should be classified as additional.

### Introduction:

For several years now there has been a discussion about the position of electrophoresis in Ryegrass. These kind of characteristics, which have the nature of being an easy target for piracy and cosmetic breeding, have been accepted as 'last resort characteristics in the crops maize, wheat and barley. In order to have a good fundamental view on this problem, we look to the use of EC in general first and secondly to its use in ryegrass in particular.

### The General Features of Electrophoresis:

Several years ago it has been decided, that in wheat, barley and maize EC may be used as last resort chars, as a supporting evidence for the expert, who is convinced of the Distinctness between two close varieties on the basis of one or more small difference(s). The EC has the function of a hard evidence to proof the suspicion that the two close varieties are to be regarded as two different varieties. The question is however where the borderline has to be drawn between the case of a suspected and a non-suspected different variety. If for instance the small differences are very small, unclear and/or suffer from year\*location\*variety interactions and yet only the electrophoretic characteristics show a clear difference? Or in other words, where is the borderline to be drawn between using / accepting and not accepting electrophoretic characteristics as a supporting characteristic. Is not the mere fact that electrophoretic characteristics show a clear difference, while the other normal and accepted characteristics do not apparently show a clear difference, sufficient to allow the Distinctness to be based on the electrophoretic characteristics alone? If the electrophoretic characteristics are necessarily to be used as the Distinctive characteristic, consequently the Distinctness will eventually be based on the electrophoretic characteristics alone.

The UPOV technical system as elaborated in the TG's and based on the DUS requirements in articles 7-9 of the Convention, a character by character comparison for Distinctness is being consistently used. The electrophoretic characteristics in the cereal crops and maize have been well described according to the UPOV system and they yield very clear and unambiguous results. They can also be regarded as being an expression of the genotype, as proteins produced in the phenotype. In this respect they do not fundamentally differ from other phenotypic characteristics like disease resistance, for which a special test is required. Overlooking these elements, it may be well concluded that any interested party - breeder or owner of a variety - may demand on right grounds that electrophoretic characteristics will be used to distinguish his variety from another close variety.

In the general discussion about electrophoretic characteristics two major objections have been mentioned: the workload for the breeder and the problem of the minimum distance between varieties leading to possible piracy of varieties.

The first objection is being dealt with by ruling that electrophoretic characteristics will not be used on a routine basis, but only in the case that all other means fail to distinguish a variety. This requirement can be met both by the position of a 'last resort' or 'additional characteristic'. The requirements for additional / last resort characteristics are that the breeder of the candidate variety agrees that this characteristic is being used and that the older variety is sufficiently uniform for that characteristic.

### Electrophoretic Characteristics and Minimum Distance

The minimum distance aspect has a more fundamental nature. The text in the former UPOV 78 Convention for Distinctness required a clear distinguishability of the new variety from all other varieties of common knowledge by one or more *important* characteristics. This requirement has been revised in the UPOV 91 Convention by the variety definition of article 1(vi) and article 7, formulating the Distinctness.

Summarised it says:

“A variety is a group of plants that can be *clearly* distinguished from all varieties of common knowledge by the expression of at least one characteristic, resulting from the genotype or a combination of genotypes”.

Nothing is said anymore of extra qualifications for the characteristics, like important, relevant or essential. This simplification has taken place on purpose, as the lengthy discussions about these qualifications have not resulted in an unambiguous definition. If we look at the situation in the ornamental species, we see that in many occasions - like mutant varieties - the one and only clear distinguishing characteristic is the difference of the expression of the characteristic flower colour. The 'distance' between a mutant variety and its 'mother' is, in genetic terms so small, that this phenomenon has become one of the pillars of the notion of essential derivation. The UPOV system accepts in fact any clear difference in the expression of any characteristic as a basis for granting PBR. This can be illustrated by small differences like flower colour in ornamentals, disease resistance in vegetables and in general, many grouping characteristics in all crops. This notion of accepting small differences as a basis for granting PBR has since a long time already been accepted in a number of crops.

If we look at electrophoretic characteristics, we have to conclude, that this type of characteristic has in principle sufficiently been identified and described, to be used as an independent characteristic within the UPOV system. The problem and the worry about minimum distance, cosmetic breeding and piracy has now become a matter for the owner of the breeders' right. The notion of essential derivation provides him enough means to act against these 'easy breeding' methods.

So conclusively, there is fundamentally not a material nor a formal objection to use electrophoretic characteristics as independent characteristics to distinguish a new variety from all other varieties of common knowledge.

### The Position of Electrophoretic Characteristics in Ryegrass

Due to the cross fertilising way of propagation of ryegrasses, the expression of electrophoretic characteristics is not uniform. Differences between varieties are shown as differences in the frequencies of the presence / absence of certain alleles. This situation is not unique however. In crops like white clover (leaf mark and cyanide glucoside), sugar beet (anthocyanin colour in the hypocotyl), and Lucerne (flower colour) similar situations of observing frequencies occur. There is apparently no principle objection to distinguish varieties on the basis of differences in the frequencies of occurrence of certain characteristics.

### The Legal Position of Electrophoretic Characteristics.

If in a concrete case, the only clear difference between two varieties can be based on electrophoretic characteristics and the breeder insists to grant PBR by accepting this clear difference, there is no solid ground with regard to the whole UPOV formal and technical system to refuse this request. Reasons of minimum distance, piracy or cosmetic breeding do not form a basis for such a refusal. These matters are not of the concern of the granting authority, like they have never been in the case of mutants in ornamental varieties. Accepting electrophoretic characteristics as a full independent set of characteristics is in consistency with the whole UPOV system.

If the breeders (Assinsel) do not favour the use of electrophoretic characteristics, they may bind themselves to rules, which provide to avoid the use of electrophoretic characteristics for the granting of PBR and as a consequence, also for National Listing. The latter is necessary as technical requirements for PBR and National Listing are the same. If not, a difficult situation will be created with the notion of 'varieties of common knowledge'.

In order to reduce the work load for the breeders and the authorities, electrophoretic characteristics should not be used on a routine basis but as an additional characteristic.

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