Position paper concerning the increase or repeal of ISTA maximum seed lot size

(Decision approved by the Ordinary Meeting of ISTA, June 21, 2001)

Starting point

Already the first issue of the ISTA Rules of 1931 contained maximum seed lot sizes (50 bags in general and 100 bags in case of grass seeds). From that time up to now maximum lot size was always one of the basic requirements for seed lots for which an ISTA International Seed Lot Certificate is issued. Maximum lot size is now defined specific for groups of species or even for single species to take into account the specific properties of seeds as well as the seed trade conditions. Since seed trade conditions change during time, also ISTA maximum lot size was changed several times, but it was always part of the ISTA sampling system.

Now, as several times before, lot size is under discussion and it is proposed by FIS to increase lot size for cereals from 25 to 30, for grasses from 10 to 20 (as presently studied in the ISTA/FIS Experiment on Herbage Seed Lot Size) and in particular with view to a harmonisation of the ISTA Rules and the AOSA Rules it was put forward whether maximum lot size could not be repealed from the ISTA Rules at all. This paper shall provide information on the ISTA position regarding maximum lot size.

Scientific background of maximum lot size

Sampling errors affect the accuracy of seed testing results. Beside sampling procedures in the laboratory, drawing of primary samples form the seed lot is a basic part of sampling. The statistical system in the ISTA Rules for calculating the accuracy of seed testing results is based on the assumption that within seed lots there is a random distribution of seed quality. This is the best possible homogeneity which is achievable so that sampling seed lots is not taken into account as separate variance component in most of the tolerance tables in the ISTA Rules. For example tolerance tables for comparing two results of other seed counts are the same whether the two samples came from the same or from different submitted samples. Only in purity testing a certain amount of non homogeneity is taken into account and consequently tolerance tables separate between these two cases.

The basic two measures for justifying this assumption in the tolerance tables are the definition of ISTA maximum seed lot size and the ISTA heterogeneity test in Appendix D of the ISTA Rules. Whereas the heterogeneity test provides help when there is any doubt about the homogeneity of a seed lot, the maximum seed lot size is a precautionary measure to avoid heterogeneity in seed lots. The efficiency of this measure is demonstrated in several scientific studies which indicate that with increasing lot size simultaneously the heterogeneity of the lots increases (review by COSTER, 1990 as well as studies by TATTERSFIELD, 1977, JORGENSEN and KRISTENSEN, 1990 and KRUSE and STEINER, 1995). The results of the three latter studies are summarised in Figure 1. It is clearly shown by all three studies that the heterogeneity nearly linearly increases. Due to the design of the studies, experimental data of the heterogeneity of the present ISTA maximum lot size could not be included in this figure but the expected value is 1% heterogeneous seed lots. So the figure shows that already in case of doubling the present ISTA maximum lot size the average percentage of heterogeneous seed lots is clearly higher than the expected value for the present maximum lot size.

Furthermore, the results from Germany (KRUSE and STEINER, 1995) clearly indicated that in small scaled seed production heterogeneity is a greater problem than in large scaled seed production. However, also in the large scaled production heterogeneity increases with lot size. Confirming this result COPELAND *et al.* (1999) reported that even for the large scaled facilities of midwest US grass seed production "Excessive heterogeneity often exists in large seed lots, especially from natural production units (e.g. fields). Such seed lots are seldom if ever blended by state-of-the-art equipment, but are simply conditioned, bagged, and marketed. Thus, the inherent heterogeneity commonly occurs among the containers (bags) in seed lots". And the authors concluded "As explained earlier, there are good reasons for the seed size restrictions on seed lots."

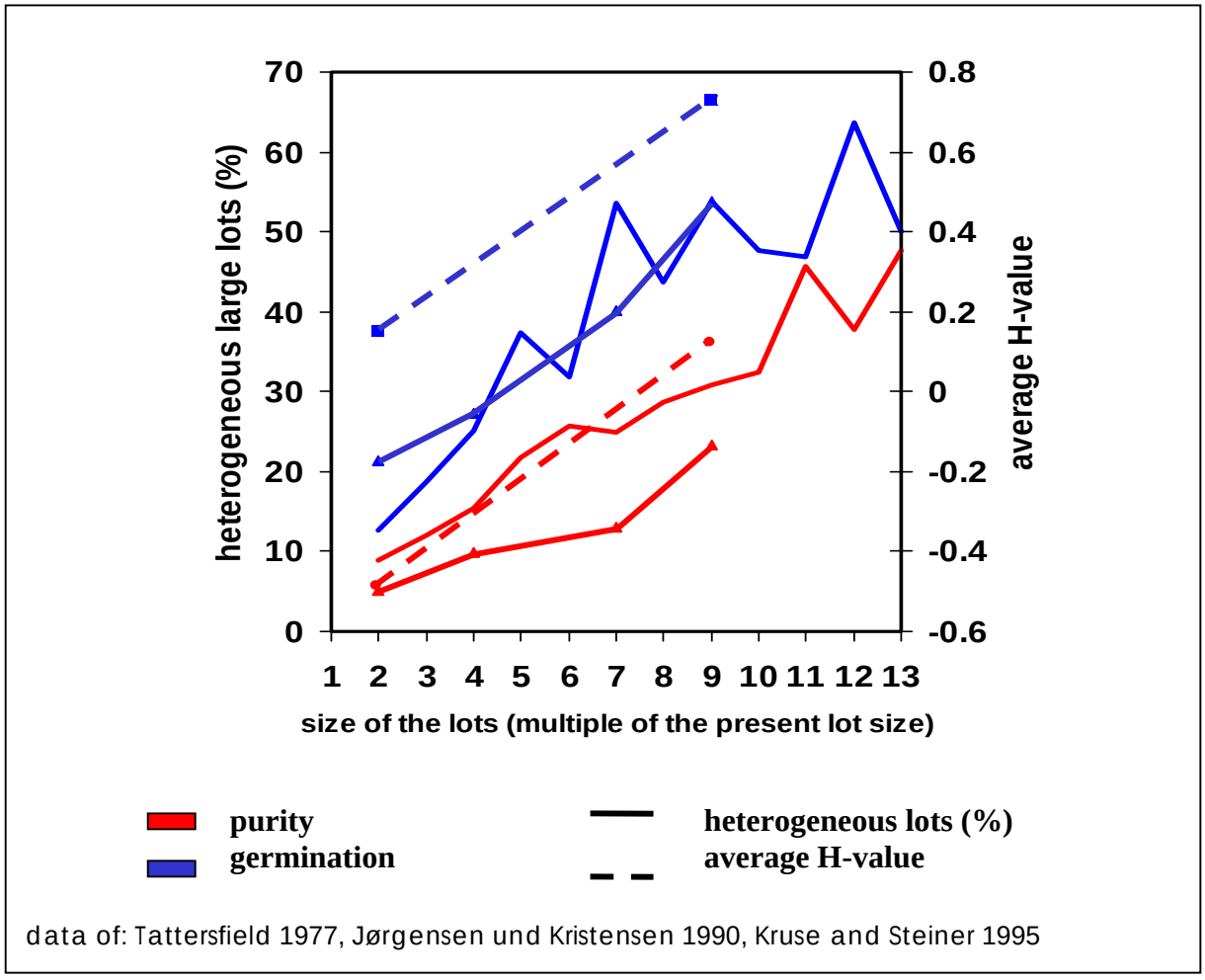

Figure 1: Increase of heterogeneity of seed lots with increasing lot size as determined in 3 different studies. (from KRUSE, 1999)

Heterogeneity in seed lots is a greater problem in chaffy seeds than in non chaffy seeds. In the ISTA/FIS Experiment on Herbage Seed Lot Size in the first phase 88 seed lots of twice ISTA maximum seed lot size were tested for heterogeneity. 75% of the big grass seed lots were classified as heterogeneous according to the ISTA heterogeneity test. So there can be no doubt that in case of increasing or repealing ISTA maximum lot size the heterogeneity of lots will increase.

Consequences

The increasing heterogeneity in case of increasing or repealing ISTA maximum lot size will lead to higher sampling errors when drawing the primary samples out of the seed lot. A strategy might be to stick to the heterogeneity test and the requirement that within seed lots only random distribution is acceptable, but by this strategy the statistical system of the ISTA Rules will not meet the practical situation. This is not acceptable. To overcome this increase of heterogeneity in seed lots it is a common idea to increase the sampling intensity, i.e. the number of primary samples drawn from the seed lot. As shown by KRUSE (1997) in case of heterogeneity it is efficient to draw several primary samples. However, the increase over the present 30 samples at maximum of very restricted efficiency and offers no solution. Consequently, the consequence will be that the accuracy of the seed testing results will be finally impaired (KRUSE, 1997). This will mean the reliability of the decisions made on the seed lots in seed certification systems or in negotiations between buyer and seller will be lower. Consequently, in contrast to the practice up to now, the heterogeneity of the seed lots will have to be taken into account in the statistical system of the ISTA Rules for all quality traits. Tolerance tables as well as the heterogeneity test will have to be changed to reflect the new situation. Since the experimental data base for this modification is presently very small, assumptions must be made which have to be agreed within ISTA between the responsible technical committees. Therefore at this time no exact quantification can be given for the factor by which the tolerance will have to be broader, preliminary estimations are between 5 and 20%.

A further fact must be considered in this discussion. The aim of the test results on an ISTA International Seed Lot Certificate is to represent the average quality of the lot. By drawing not one but a number of primary samples from the seed lot, the heterogeneity in the seed lot affects not unrestricted the accuracy of test results. But going beyond this aim, the buyer of only some of the containers of a lot expects that the results given on the certificate and on the label represent the quality of the containers he bought. Although this expectation is statistically not really justified, it is a common expectation in seed trade practice. And here it has to be realised that the reliability of the test results with view to this expectation is not unrestricted but directly impaired by a heterogeneity among the containers in the seed lot. So from the viewpoint of the consumer, who buys a few bags from a seed lot, heterogeneity of seed lots is much more important than from the viewpoint of the producer, whose interest it is that the lot meets the quality standards e.g. in a seed certification system.

Conclusion

As a technical organisation ISTA concentrates on improving the quality of seed testing results and on assuring the level achieved in ISTA laboratories. Since the reliability of seed testing results on the ISTA International Seed Lot Certificate will definitively be impaired if ISTA maximum lot size is increased or deleted, ISTA will not actively promote a change of the ISTA Rules in this direction. However, if all other partners in seed trade as seed sellers, seed buyers as well as the seed certification agencies agree to bigger lots, ISTA has to and will adapt the Rules to their position and will manage the technical consequences of this adaptation, in particular by setting up new tolerance tables reflecting the lower quality of seed testing results.

References

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