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Opinion
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What are the Contemporary Possibilities to Improve Biological Seed Quality? Some Private Opinions

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Opinion

The quality of seeds is the cheapest agrotechnical intervention, especially in the event of stressful environmental conditions. Characteristics such as trueness to variety, germination percentage, purity, vigor, and seed emergence, video meter utilization, germinator utilization, isothermal calorimetry, measurement of the leakage of electrolytes, cold test germination, warm germination, the saturated cold germination test electrical conductivity, bulk conductivity, controlled deterioration test , tetrazolium test, importance of the germination in heavy water, intensity germination during the year, long term seed storage change on basic seed traits, trueness to variety; thousand seed weight, the presence of inert matter, the seed of other crops or weed seed; viability, germination percentage; the level of dormancy, vigor; rapidity of seedling emergence, appearance, and freedom from the disease are important for practical use to farmers. Traits are suitable for screening, but with low efficiency, thanks to the contemporary metabolic similarity of the crop cultivars and probably thank the climatic changes. There have indeed been advancements in many aspects of seed breeding overall, but it is still a slow process in comparison with the rapidity of global warming and the growth of weather variability.

Despite considerable advances in science (molecular biology, biochemistry, and utilization of physiology of plant integrity) is possible to conclude, that the classical seed tests are not yet successfully replaceable by biochemical tests or by molecular tests although they probably have the great future. However, there are also a lot of other important seed traits. For example, the effectiveness of water uptake and water utilization at the time of sprouting, the essence of seed longevity. In order to increase of seed quality, it is necessary to turn our attention on the evaluation of environmental influence on the individual level of basic metabolic plant functions under standard and stressful conditions, which then have an influence on the forming properties of seeds.

Thus, not only the selection on the basis of seed traits but selection through the change and modification of the basic metabolic functions leading to seed formation is the future breeding work. The reduction in germination and in field emergence, which was observed due to an inadvertent co-selection of genetic variants associated only with food quality is very important and warning (for example at rapeseed decrease of seed vigor). This is also very important for the phenomenon of seed deterioration.

Seed deterioration during storage. It is an irreversible phenomenon, which is natural for living organisms. Aged seeds influence the decrease of optimal root growth (the angle of root growth in the soil, depth penetration, tillering, etc.). Analysis of -metabolism of long-term seed storability is still partly neglected. Important is and will be the genetic manipulation of genes controlling cellular repair, protection, detoxication, and enhanced membrane integrity. Utilization of availability of genes in enormous seed-specific genomic libraries and with high-precision-omics techniques like CRISPR-Cas9 constitute resources for the improvement of the seed traits.

The possibilities to use world plant reservations for search of new species for agriculture exists.

In the current era of human development, a small basic number of utilized crops for human food is very disadvantageous from the ecological view and especially in the security of the future of human food resources.

Breeding to increase yield, quality and resistance to pests and diseases have led (especially in the 20th century) to a narrowing of the gene pool, genetic diversity. Cultivars are more and more similar to the morphological and physiological points of view. It is a process of disadvantageous convergence also problematic in complex seed. It can be stated that there are a large number of

plants that have not been explored yet, which grow in extreme locations and thus have with large probability the desired seed properties for new climatic and soil conditions. Exploited new plant species that can (probably will be) be used in nutrition lead to result in greater biodiversity in seeds regardless of ongoing genetic erosion.

The advantage of seeds of C4 plants follows from the metabolic processes in C4 plants because they are more efficient in carbon dioxide utilization that results in increased efficiency in water and nitrogen use and improved adaptation to hotter and dryer environments. That is to say, seed growth and development are mostly in "better conditions" and thus the seed has better opportunities for growth and development especially in stressful conditions.

Aboveground growth of C4 plants responds more strongly to atmospheric CO2 concentration when soil water is limiting rather than abundant. Whether the same is true of root growth and their morphology, seed traits, however, remains to be more detailed evaluated. Nevertheless, the seeds of C4 plants have greater guarantee stability of growth and seed development.

Organic seed is produced by organic farming. Organic seed is the seed, that is produced by certified organic operation i. e by organic farming methods. In some physiological and biochemical seed properties, there is a similarity to species that grow in nature.

It is generally known, that plants bred under organic conditions are better adapted to these environmental conditions. Adaptation is key to achieving resilience in our food and agricultural system. The most likely significant mistake during seed production is that more than 90-95% of organic seed production is based only on the utilization of crop varieties that were bred for the conventional high-input sector. It isn´t an optimal situation, because most of the contemporary varieties lack important traits required for cultivation under organic and low-input production conditions. Utilization of more extensive varieties or varieties bred at more extensive conditions would be more appropriate.

It is possible to provide a selection of suitable genotypes already during seed germination. These traits are important for subsequent growth and development. Why?? In the juvenile phase and in the later stage, the same genotype is still active. It is important and necessary to comprehensively analyze the plant, from roots to shoot, their interaction, and during the plant life cycle from the seed development to senescence. This approach can lead to obtaining a better good seed. It is desirable to analyze the relationship between seed development and their quality, maternal plant properties, environmental conditions at the molecular, cellular, physiological and agronomical levels. Seed quality is also influenced by the sink:source ratio as well. Optimal root:shoot ratio during the vegetation period is very important for seed development.

The influence of the root different traits for the seed's growth and development is very significant and this relationship also exists vice versa. It has been noted that a 1% chance of the root system size corresponded approximately to a 2% change of the grain yield.

Embryo importance. Embryo importance is not negligible. As follows from literary information, the comparative metabolomic analysis of the (wheat!) embryo and endosperm during seed germination metabolite changes in the embryo are much greater than those in the endosperm, i.e there is the probability that the embryo is more active then the endosperm during seed germination. There are future selection possibilities?? The embryo contains most of the genetic information, and shows increased nucleotides contain during the seed germination process, that is to say, indicating active transcription and translation metabolisms. Under stressful conditions, oxidative damage to mRNA results in the inhibition of protein synthesis caused a disturbance in protein functions due to enzymatic and binding properties modification.

Seed germination may delay or suppress.Seed germination research has made progress. New analyses of transcriptomes, proteomes, proteom and metabolomes have advanced our knowledge and a holistic understanding of metabolic seed processes. The analyzis of proteins at different stages of seed development have provided information the importance of protein synthesis during seed germination], as well as factors involved in seed viability and longevity while metabolome profiling has shown that a metabolic switch is an important aspect of seed maturation and germination Analysis of plant hormones, has revealed balance among plant hormones during seed development and their germination

Experiments involving utilization of many different localities, more experimental years, more crops and their cultivars and which allow to derive metabolic biochemical models for seed development under appropriate conditions are desirable.

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