Phytosanitary Protection in Horticultural Seed Production: A Bridge to National Seed Demand

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Abstract: The problem of quantifying seed losses and their effect on agricultural production and food availability is of primary importance to meet national seed demand. Through that, rational control measures can be developed and applied and resources can be better allocated as well. Seeds being living things, respire by absorbing oxygen and giving off carbon dioxide and water vapour, producing heat at the same time and these phenomena play a major role in its preservation as if not properly taken care off, could cause the seeds to stick together, coagulate as a mass, creating blockage in the store. Seed deterioration is due to a number of interrelated factors like physical e.g. temperature, humidity, water; Biological like microflora (mould, bacteria , fungi, yeast etc) or arthropods (insect, mites); Vertebrates (rodents, birds) or technical (conditions, methods, duration of storage) as well as state of seeds (broken, impurities, residues etc). Infestation in the field, during transportation, storage premises, sacks and containers as well as putting contaminated seeds in store and unhygienic store are inimical to phytosanitary protection and cause losses in seed viability. A reduction in these losses would lead to production of high quality and quantitatively valued seeds to meet national seed derived.

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1. Introduction:

The food products which man has to preserve in other to feed himself are of animal or plant origin. The former-milk product, meat, fish etc require expensive freezing and sterilizing facilities. The later consist of perishable commodities such as roots, tubers, fruits and vegetables, which are not stored for long periods of time, and durable commodities such as cereals and legumes which are preserved for several months and sometimes even for a number of years (Nwufo, 2004; Babatola, (2000).

Seeds consist of the embryo and the seed coat. In many spermatophyta, the seed also contains a special tissue in which the food reserves are stored. The embryo, resulting from the proliferation of the egg is the analog of the future plant in horticultural seeds, the organs for propagating the plant species are normally protected against adverse factors. Thus, their water content may reach an excessively low percentage (well below 4%) thereby entail a very slow metabolism. They are preserved from external attack by their seed coast and by the production of bactericidal and fungicidal substances. (Hall, 1971; Chirapp, 1988)

Seeds, being living organisms, respires by absorbing oxygen and giving off carbon dioxide and water vapour, producing heat at the sometime. These phenomena play a major role in the preservation of horticultural seeds to meet the national seed demand. The seed at any point in its storage life should have ideal seed reserve. These reserves are stored by the plant to be subsequently used inter alia in order to develop, after hydrolysis, vegetative organism when activity is resumed. Examples are albumen starch, bean and pea parotids, groundnut lipids etc.

Horticultural seeds in bulk behave just like a fluid; it runs or can be sucked up, the flour depending on the form, size and moisture content of the seeds and how clean it is. Damp or heating may cause a number of seeds to stick together and coagulate as a mass, creating blockage in the store (bags, baskets, silo pipes etc). The natural angle of repose of a heap of grain for example is around 30^0 (Multon, 1982).

Between the grains in a heap there is a substantial volume of air (around 40% of the overall volume) which circulates slowly due to convection currents. When it become necessary to dry or cool grain, or even to replace the air by gases (such as nitrogen or carbon dioxide) forced ventilation is employed, using blowers provided for this purpose in the silos.

2. Problems of Horticultural Seed Preservation

The main problems connected with the preservation of horticultural seeds in tropical climates are the result of the high temperature which prevails throughout the year typical of these regions and the effect of temperature depends however, very much on ambient humidity, which varies considerably according to region and the time of year (Sharples, 1990).

In order to meet National seed demand, horticultural seeds should be mostly preserved in dry regions than in wet region, since the maximum threshold of 13% moisture content in the seed is attained at harvest time, whilst in wet region drying facilities are essential. Rainfall is one of the principal uncertainties with which farmers have to contend. In a dry climate, the inadequate rainfall may hamper horticultural seed production. To guard against such an eventuality, governments should make provision for strategic stocks. Normal, well-distributed rainfall sometimes leads to bumper harvest. The capacity of existing storage facilities is then sometimes inadequate to accommodate them. In wet climates, it may also happen that excessive rainfall will make harvesting difficult resulting in the rotting of the seeds in the filed.

Horticultural seed deterioration is due to a number of interrelated factors which can be modified by man either by aggravating their effects, through negligence, ignorance or error, or by limiting or nullifying their impact by prudent measures and good store hygiene. There is a whole range of physical, chemical and biological phenomena which remain constant and with which it is essential to be controlled so as to meet the natural seed demand of horticultural seeds.

These include:

1. Physical: Temperature, humidity, water, gas.
2. Biological: Microflora (mould, bacteria, yeast, etc) arthropods (insects mites) vertebrates (rodents, birds).
3. Technical: Storage (conditions, method, duration, etc), state of the seed (whether it is broken, impurities, residues etc) (Appert, 1987; Anslem, 1981).

Insects may be vector of bacteria and pathogenic protozoa and thus carry typhoid and dysentery. They may also give rise to allergies due to the impurities contained in the grain, for which they are responsible, or their presence may even give rise to mould and mites.

3. Deterioration of Horticultural Seeds

When horticultural seeds are attacked, their quality are impaired either as a result of the embryo being consumed or merely damaged or as a result of the food reserves being partly or completely eaten. *Coleopteran* of genera *Tribolium, Orgzaephilus, Callosobruchus, Lepidoptera* such as *Ephestia cautella* and mites such as *Acarus siro* show a preference for the germ, which leads to a reduction in germination capacity. Other pests such as weevils of genus *Silophilus* or *Silotroga* sp. Moths attack only the starchy part of the grain, thus enabling it to germinate, although the plantlet will not have sufficient reserves to develop normally.

Infestation of stocks comes either from outside or inside the premises where the goods are stored. It is important to be able to specify where it originates, in order to be able to choose wisely the control measures to be employed and to prevent, by means of appropriate measures, the incident from recurring (Poulet and Hubbert, 1982).

i Infestation in the fields

Certain speicies only (but these are the most dangerous and may be in hidden forms) start to lay their eggs on or in the seeds as soon as it ripens, prior to harvesting, or during the period between harvesting and storage, which may be fairly long if drying of the seeds is necessary.

The weevils *Sitophilus oryzae* and *S. zeamis*, the adults of which fly, lay their eggs on seeds before and during the storage period. The same applies to the groundnut beetle, and to *bruchids* in legumes and *alucitidae* in maize.

ii Infestation during Transportation

A batch of pest free seed, transported from the field, village or collection centre to the slore or silo by carts, trucks or wagons may be contaminated by insects hidden in nooks and crannies, gaps between the boards, folds in covers or debris from previous loads that has not been swept out properly.

iii Infestation by insects flying in from outside

There is of course no need to fear this type of infestation in hermetically sealed stores like silos, but only in warehouse, open stores and transit facilities.

iv Infestation from the storage premises, sacks and containers

If the containers used for the horticultural seeds have not been thoroughly cleaned out, or if the stores have not been maintained since the previous crop was removed, i.e if cracks have not been blocked up, doors and windows do not close properly, or there is waste, packaging material or dust lying about, there is a greater risk of generalized infestation of the incoming grain. Certain highly resistant long-lived species such as *Trogodermae* and *Silavnidae*; and *Cryptolestes* or *Tribolium* (which are fond of broken seed or dust), are commonly found in poorly maintained storage facilities (Hall, 1980).

v Infestation caused by putting contaminated seeds into store

The whole contents of a healthy store may be infested by introducing a batch of contaminated seed; such seed should either be rejected or disinfected prior to storage.

4. Store hygiene and Phytosanitary protection:

It can never be stressed too often that perfect maintenance and scrupulous cleanliness of the container bags, stores granaries, and silos intended to accommodate the seed are the best guarantees of excellent preservation, provided of course, that the goods in question have been properly dried and treaded beforehand. If the seed becomes damp again during storage, this can only encourage insects to multiply rapidly (ISTA, 1987; Nwufo, 2004).

5. Losses in terms of the viability of seeds

Horticultural seeds preserved for sowing the following year are the subject of particular care in view of their considerable potential value. In order to preserve their germination capacity, so as to meet the national seed demand, care must be taken to protect them not only from the insects which attack the germ, but also from excessively wide variations in height, humidity or temperature.

Horticultural seed loses may have serious repercussions on the amounts of food available the following year for the family and sometimes even nationally. In order to meet national seed demand, horticultural seed should be preserved in such a way that there should be reduction in its nutritional as well as qualitative losses. Qualitative losses are partially subjective in that they are assessed according to consumer taste and criteria used by local traders.

Normally they are judged on the basis of appearance, size, shape, small, flavour etc. The presence of foreign bodies and various impurities inevitably reduces the value of the goods. While it is possible to eliminate these undesirable elements, contaminants are in completely different matter. These consist of the solids excreted by insects, pathogenic organisms spread by rats, *mycotoxins*, pesticides residues etc. In the case of oilseeds attacked by insects, the level of free fatty acids increases, causing the goods to go rancid.

Nutritional loss represents a reduction in the food value of the horticultural seeds as a result of a lowering of its protein, hydrocarbon and vitamin content. Pests prefer to consume certain parts of the seed, thus rodents and caterpillars go for the germ, thereby destroying a high proportion of proteins and vitamins. Pulse beetles significantly affect the protein levels, while weevils, which eat into the endosperm, reduce the hydrocarbon content of cereals. Vitamin losses are due to pests which feed on the bran or to cryptogamic infection (Hall, 1971; Teng, 1980).

6. Loss of goodwill

In other to meet national seed demand, horticultural seeds should be preserved so that loss of goodwill would be avoided. Loss of goodwill is not immediately quantifiable but crucial all the same, that is why producers must endeavor to offer for sale seeds which meet the quality standards and agree to comply with control measures. As products intended for export have to meet increasingly stringent standards, their reputation for quality will have considerable repercussions for the country's economy (Appert, 1987).

Conclusion

Horticultural seeds are susceptible to deterioration and heavy losses at high temperature and relative humidity and losses include poor harvesting, handling and poor storage condition as well as pest and disease infection. These reduce the quality and quantitative value of the seeds. These losses should be reduced to a minimum to meet the national seed demand.

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References

[1] Anslem, C. (1981). Assessment of crop losses caused by seed-born pathogens. *In Crop loss Assessment* Methods. Supplement 3, 97-101.

[2] Appert, J. (1987). Storage of food grains and seeds. The Tropical Agriculturist. *CTA/Macmillan Publishers Ltd*. pp. 145.

[3] Babatola, J.O. (2000). Post-harvest Technology of Horticultural Crops as a means of improving Dietary Intake and Socio- economic Empowerment of Youths in Nigeria. *Theme Paper, 30th Ann. Conf. of Agric Soc. Of Nigeria*. September 1-4, Univ. of Agric Abeokuta Nigeria.

[4] Chirapp, L. (1988). Worldwide losses due to seed-born diseases. Seed Pathology. *Proceedings of the CTA Seminar* held at Copenhagen, Denmark, June 20-25. 17-23.

[5] Hall, D.W. (1971) Handling and storage of food grains in tropical and subtropical areas. *FAO Agricultural Development* Paper No. 90.

[6] Hall, D.W. (1980). La desinsectisation descereales stockees. *Bull. Techn. Inf.* No 349. Ministerede I' Agriculture Paris.

[7] ISTA, (1987). International Seed Testing Association. Report on the first *International Serology Workshop, Wageningen.*

[8] Multon, J.L. (1982). *Conservation et stockage des*

grains et graines et produits derives Technique et Documentation Lavoisier Paris.

[9] Nwufo, M.I. (2004). Securing the harvest to ensure food for all. A Plant Pathologists Perspective. *9th Inaugural Lecture Federal University of Techonlogy, Owerri*. July 28. Pp. 65.

[10] Poulet, A.R. and Hubert, B. (1982). Les petits mammiferesm, in *Les Ravageurs des cultures vivie res et maraicheres sours les tropiques".*Maisonneuve et Larose, Paris.

[11] Teng, P.S. (1980). Crop loss assessment. In Proceedings of E.C. Stakman Comm. Symposium. MSc. *Publ.*

7. Agric. Exp. Station, Univeristy of Minnesota.

[12] Sharples, R.O. (1990) Future Directions for Horticultural Post-harvest Technolgoy. *Post Harvest News and Information.* Vol. 1 and 3. Pp 191-194.

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