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A Review on Effects of Post-harvest Management on Quality of Maize Seed

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Abstract: **Maize production and productivity is directly affected by biotic and abiotic factors. Once quality of crops are affected final yield and yield related parameters are also affected. Quality seed is key factor to increase production and productivity of maize seed. The main objective of this review was to review effects of post-harvest management on quality of maze seed. Post-harvest management of seed are started from processing up to storage for the next planting season. However, mainly most crop seed are lose their quality at this stage. Among those factors, storage devices, storage condition and storage duration are the core to reduce the quality of maize and increase economic loss. Seed physical and physiological quality are mainly affected if it not packed with preferable material, stored under un-conditioned place and stored beyond recommended duration. Development of fungus, molds and different biotic factors are accelerated if seed is lacked with good management. In which seed quality are greatly affected and finally reduce yield and yield related parameters. To increase production and productivity of maize seed, increasing level of quality through packed with preferable materials, stored under conditioned environment and not stored for long time of period. Generally from the point of this review, to increase seed yield of maize crop, maintaining the quality level of seed by taking maximum care specially through performing good post-harvest management are the best.**

Keywords: **Maize, Production, Productivity, Seed Quality, Storage.**

1. INTRODUCTION

Maize (*Zea mays* L.) is the third most important cereal grain worldwide after wheat and rice (FAOSTAT, 2014). Among the most cereals, maize is highly used for food in various forms like flour and meal are most popular. In addition to human food maize crop is useful for animal feed thus demand for maize consumption is highly doubled by 50% (Martinez *et al.*, 2011). The crop is covered about 15-20% of daily total calories of diet for more than 20 developing country found in latin America and Africa (Adetiminrin *et al*., 2008). Adaptability for all agro-ecology is increase importance and acceptance to produce maize crop and as discussion of Fakorede *et al*., (2003) importance and its rank among cereal crops is increasing in the sub-region over the last few decades.

The estimated maize consumption in the African region where it is a staple food ranges from 52 g/person/day in Uganda to 328 g/person/day in Lesotho (Ranum *et al.*, 2014). Inspite of high demand for maize consumption, Sub-Saharan African countries, however, do not produce enough maize to meet their demands and therefore import more than three million tons of maize annually (Pingali and Pandey, 2001). Demand for maize in sub-Saharan Africa is projected to increase nearly two folds by the year 2020 (Bigirwa *et al.*, 2003). In addition to limitation on production of maize, produced product also loosed its quality through different factors. Since quality seed is baseline for increment of production and productivity, once physiological and physical quality of any seed are affected, frankly it can be reduce yield and yield component of the crops.

Seeds of most crops can be severely damaged and lose its quality when stored under unfavorable condition, stored for beyond recommended duration of time, produced under less management and below or over of recommended agronomic practice. High seed quality is necessary to establish crops, therefore cultivated seed should have vigour and related physiological characters (Farshadfar *et al*., 2012). The low yield per hectare is attributed to many factors, such as unavailability of quality seed in which poor quality seed results in poor germination and poor crop stands at farm and become a significant factor affecting maize productivity. Therefore the main objective of this review was to review effects of post-harvest management on quality of maize seed.

2. LITERATURE REVIEW

2.1 Importance of Quality seed

The importance of quality seeds has been recognized from the time ancient and has been treated as sacred, being an important factor in the improvement of agriculture and agrarian societies. Seed quality is defined as standard of excellence in certain characteristics and/or attributes that will determine the performance of the seed when sown or stored. Although seed is the most vital and crucial input for crop production, one of the ways to increase the productivity without adding appreciably to the extent of land now under cultivation by planting quality seed. Seed quality is expressed in many extents it should be pure or maintain its quality in terms of genetic, physically and physiological. To be fulfill the criteria of quality, Seed must be free from other seed, weed seed, disease, and capacity to germinated, vigorous and have be ideal moisture content. Seed of improved maize variety is very essential to increase yield and growth establishment. In Ethiopia there is the formal system and the informal system (sometimes called local or farmers seed system). Both systems are operating simultaneously in the country and difficult to demarcate between the two. There is however, a fact that the formal seed system is the original source of improved seeds in the informal system. There is also a system referred to as integrated seed system. Other forms of seed systems operating in both systems also exist such as Community-Based Seed System (CBSS). Though not well developed, few commercial seed systems, as part of the formal system, are also operating in the country (Abebe and Lijalem, 2011). The level of quality seed for all seed system are quietly different from each other and demand for improved seed is extensively increase because of high quality.

3. EFFECTS OF POST-HARVEST MANAGEMENT ON QUALITY OF MAIZE SEED

3.1 Effect of storage materials on seed quality

After harvested, maximum care must be given for the seed to save it from declination in the quality. Post-harvest management of seed are started from processing of seed up to storage for the next planting season. However, mainly most crop seed are lose their quality level at this stage. Among those factors, storage devices, storage condition and storage duration are the core to reduce the quality of maize seed. After grading, seed are ready to pack with good packaging materials, during this time it need special skill and preferable materials to pack. Kietreiber (1971) reported 26% increase in black point infection in durum wheat stored with unfavorable packaging material. In addition to that seed germination and other physiological quality parameters was significantly reduced after six month storage of seed stored at gombissa without packaging materials and packed with sack for maize seed (Negassa et. al, 2020).

3.2 Effects of storage condition on seed quality

Storage condition is another factor that can reduce level of quality of seed. Temperature, humidity and moisture content of seed are factors that aggravate deterioration of seed under storage. irrespective of the initial seed quality, unfavorable storage conditions particularly air temperature and relative humidity contribute to accelerating seed deterioration (Heatherly&Elmore, 2004). High relative humidity and temperature cause high moisture content in seeds and result in low germination at the end of storage (McCormack, 2004). The purpose of storage is to maintain harvest quality of product, not to improve it (Sisman and Delibas, 2004) storage has direct relationship with quality of seed which means if the product are stored under well-organized storage condition the quality of the seed may not affected or may the level of deterioration is minimize. The factors accelerate deterioration of seed in storage are environmental factor with addition of development of insect pest infestation, molds formation on surface of the seed and nature of the seed itself which is genetic makeup of the seed. Poor seed storage conditions have been reported to cause up to 10% loss in seed quality in the tropics mainly through loss of viability (Negassa *et.al*, 2020).

The biochemical processes occurring in seed are directly influenced by moisture content, air temperature, contact with air and condition of seed (degree of damage) (Siadat *et al*., 2012; Ghasemnezhad and Honermeier, 2007). Seed deterioration can be defined as the loss of quality, viability and vigor either due to aging or effect of adverse environmental factors. The rate of deterioration rapidly increases in either seed moisture content or temperature of storage (Kapoor *et al*., 2010). Decrease in seed vigor is due to decrease in seed quality, percentage, rate of germination and yield and also can increase susceptibility to environmental stress (Tekrony *et al*., 1989).

3.3 Effects of storage duration on seed quality

Seed characteristics decrease under long storage condition due to ageing. Changes that occur in seed during aging are significant in terms of seed quality (McDonald, 1999). The rate at which the seed aging process takes place depends on the ability of seed to resist degradation changes by protection mechanisms which are specific for each plant species. Most cereal grains can be stored for long duration without microbial infections, although biochemical changes could occur during storage. but, during seed storage, seed deterioration processes could be rapidly started and followed by respiration and loss of seed matter (Reed, 1992) because of seed are living entity that are continued to respire even after harvested from mother plant. Good seed quality relates to the characteristics of seeds that result in high field performances and eventually high seed/grain yield (Adebisi, 2004). One important component of seed quality is seed/seedling vigor, which is defined as the sum total of those properties of the seed that determine the level of activity and performance of the seed or seed lot during germination and seedling emergence (Hampton and Tekrony, 1995). (Belay *et, al*, 2017), reported that maize seed stored for variant duration was registered the low seed physical quality parameters as longevity of storage was increased. After eight months of maize storage in the uncontrolled warehouse in South Africa, the germination declined from 87-99% to 50–80% (Tekrony et.al,2005). In other reports, as maize storage duration with bad storage material under uncontrolled conditions, germination percentages and other physiological parameters of maize was reduced under lowland maize production area of Ethiopia (Negassa *et.al*, 2020).

4. SUMMARY AND CONCLUSION

Maize (*Zea mays* L.) is the third most important cereal grain worldwide after wheat and rice. It is the most important cereal crop in sub-Saharan Africa and accounts for 15-20% of the total daily calories in the diets of more than 20 developing countries found in Latin America and Africa. The estimated maize consumption in the African region where it is a staple food ranges from 52 g/person/day in Uganda to 328 g/person/day in Lesotho. It shows wide adaptation to diverse agro-ecological conditions and cropping technologies. Sub-Saharan African countries, do not produce enough maize to meet their demands and therefore import more than three million tons of maize annually even though the demands are increased by two folds.

Reduction in quality is attributed to many factors such as storage material, storage condition and storage duration. High quality seed is important to ensure maximum seed germination and seedling vigor, which is turn is instrumental in achieving maximum yield. poorer quality seeds show low viability, reduced germination and emergence rates, poor tolerance to sub optimal conditions and low seedling growth rates. The seed quality is also reflected in the final growth, maturity of plants, their uniformity and stability of yield. Storage material is the main post-harvest factor reduce quality and maize productivity. The problems associated with establishing vigorously growing maize seedlings are often related to poor seed quality which is affected during storage through aging, storage condition, material and both by biotic and a biotic factors. All activity taken on seed specially at post-harvest condition need maximum care to maintain the quality level, biotic and abiotic factors are aggravate deterioration of maize seed under uncontrolled condition of storage. Long term storage beyond recommended duration also increase reduction of seed physical and physiological quality of maize seed. Storage material also have adverse effects on maize seed quality reduction. Generally, post-harvest activity viz, storage materials, storage condition and storage duration of seed play significant role in reduction of quality and consequently production and productivity of maize and maximum attention is needed to reduce losses during storage of maize.

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