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EFFECT OF SEED MATURITY AND STORABILITY ON VIABILITY AND VIGOUR IN PEA (*Pisum sativum* L.) SEEDS

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Abstract

Storability of seeds is affected by several factors viz., internal (seed moisture contents, stage of seed maturity, composition of seed, physical state of seeds), external factors (temperature, relative humidity and micro flora) and genetic factors. Stage of seed maturity determines the storage potential of seeds if all the factors are kept constant. Although this appears simple principle for individual seeds but a complicated job in plants with indeterminate flowering pattern like pea and is often mismanaged by the growers who use their own saved seeds; a common practice in Pakistan. In such crops, single harvest results in seeds having different degrees of maturity and storage potential. Therefore, an experiment was designed to evaluate the production performance of pea seeds harvested at different stages. Seeds were harvested at two different stages namely mature green stage (fully developed seeds but green in colour) and physiological maturity and stored under room conditions to compare with farmer's storage environment. Performance was evaluated by conducting emergence test and vigour test at monthly interval to observe the effect of seed maturity on viability and vigour. Time to 50% emergence, mean emergence time, final emergence percentage, vigour index and root and shoot fresh weight was higher for physiologically mature seeds. But dry weight for root and shoot were statistically non- significant over the period of study. Results indicate that physiologically mature seed performed better than immature seeds. So spot picking of physiologically mature seed should be done instead of single harvest in peas.

INTRODUCTION

Pea (*Pisum sativum* L.), from the family Leguminaseae, is native to Europe and Northern Asia (Warren et al., 1956). It is a self pollinated annual herb, bushy or climbing with weak stem (Duke, 1981). It ranks 4th in the world on production basis (441.53 thousand tonnes) among grain legumes after soya-bean, groundnut and french beans and is grown on an area of 528.71 thousand hectares (FAO, 2005). Although seeds of most species are capable of germination long before physiological maturity (Giri, 1967) but the stage of seed maturity determines the storage potential of seed if all other factors are kept constant (Fontes and Ohlrogge, 1972). Maturity and storability of seed are important but the exact relationship between these variables is not elucidated. Viability

equations developed predominantly from storage experiments under various temperatures (Ellis et al., 1982) were used to estimate seed deterioration and longevity. The postharvest treatments often include methods and temperature of drying, storage moisture content, storage conditions and duration (Pearce et al., 2001). Seed health refers primarily to the presence or absence of disease-causing organisms such as fungi, nematodes, bacteria, viruses and insects associated with seed. Farmers often use seeds that have impurities and contaminants and are infected with pathogens (Fujisaka et al., 1993). The importance of seed quality in realizing the full potential of a variety is well known. The three major aspects of seed quality are a) genetic and physical purity, b) high germination (%) and vigour, and c) freedom from seed-borne diseases and insects (Seshu and Dadlani, 1989). Seed vigour is recognized as an important seed quality parameter distinct from germinability (Seshu et al., 1988). The objectives of this study were to study the effect of seed maturity and storability on viability and vigour in pea seeds.

MATERIALS AND METHOD

The pea seeds of cultivar Meteor were harvested at two different stages viz., physiologically immature (fully developed but green in colour) and physiologically mature in the month of February and April respectively and stored under optimum room conditions from May to September. Seed quality was evaluated at monthly intervals to observe the effect of seed maturity on viability, vigour and storability of seed. Seed emergence test was carried out according to rules of ISTA (1993), performed on four replications of 50 seeds each. The seeds were incubated in sand plates at 23±2°C. Data was collected at about 50% emergence (Coolbear et al., 1984), emergence rate (Kotowski, 1926), final emergence percentage, vigour index (Abdul-Baki & Andersion, 1973) and seedling fresh and dry weight and subjected to statistical analysis in accordance with the procedures of Steel et al. (1997). Treatment means were compared for difference by the method of Least Significant Difference (LSD) test and presented in graphic form (Figure 1 to 6).

RESULTS AND DISCUSSION

Seed type and month interval as well as their interaction showed statistically significant results for time to 50% emergence. Mature seeds prove better results than that of immature seeds. The value of T_{50} decreased with passage of time in both types of seeds being more for mature (6.45 day) and immature (6.93 days) seeds in first month and 2.65 and 3.01 days for mature and immature seeds respectively, after fifth month of harvesting. So, time taken for 50% emergence of seeds was inversely proportional to the time of seed storability (Figure 1).

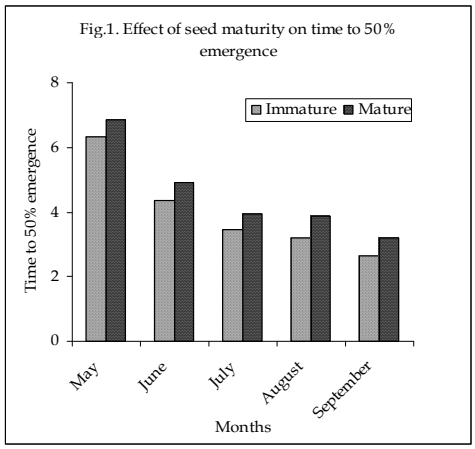
Emergence rate is the direct measurement of seed vigour. If the seeds are highly vigorous then its emergence rate will be higher. Emergence rate was highly significant among the seed types. Results also remained significant among the month interval and their interaction with the seed type. The fastest emergence rate was recorded in mature seeds (81.58) and was slow in immature seeds (67.44) after five months of harvesting (Figure 2). So, it proved that with the passage of time emergence rate improved in both types of the seeds but more in mature seeds than immature seeds in all months.

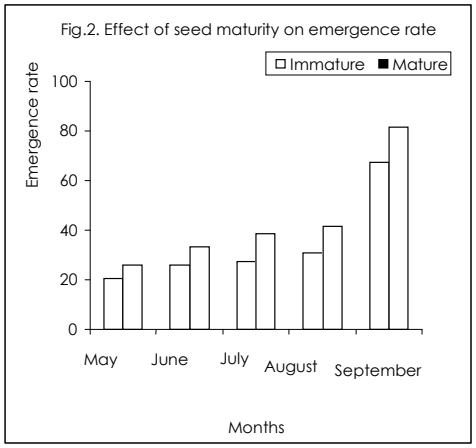
Final emergence percentage is the percentage of total number of seeds germinated at termination of the experiment. Results remained non significant among the seed type but significant among the months and their interaction. Maximum final emergence percentage was recoded in fifth month and minimum in first month after harvesting. On the other hand, in case of interaction between month interval and seed type means, mature seeds give maximum (100%) and immature seeds (95%) final emergence percetnage (FEP) in fifth month after harvesting (Figure 3). So, with the passage of time final emergence percentage improved in both types of the seeds but final emergence percentage was more for mature seeds than immature seeds in all months.

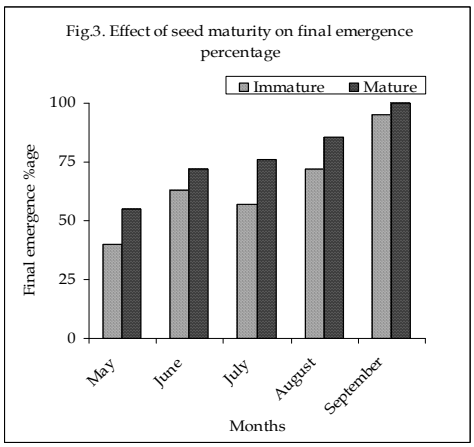
Month interval as well as their interaction with the seed type showed statistically significant but among the seed types non significant results vigour index. However, mature seeds

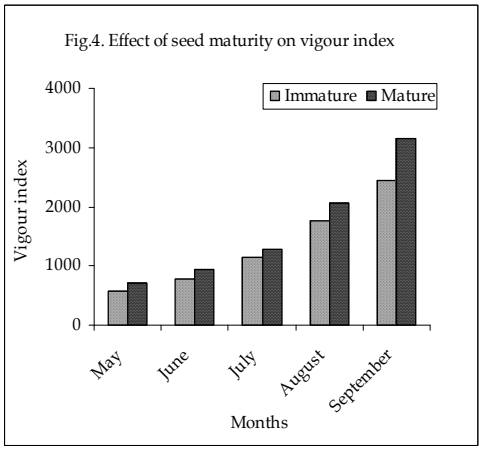
prove better results than that of immature seeds. The vigour index increased with passage of time in both types of seed being more for mature (3149) and immature (2447.15) seeds in fifth month and 562.94 and 547.26 for mature and immature seeds respectively, after one month of harvesting (Figure 4). So, vigour index of seeds was directly proportional to the time of seed storability.

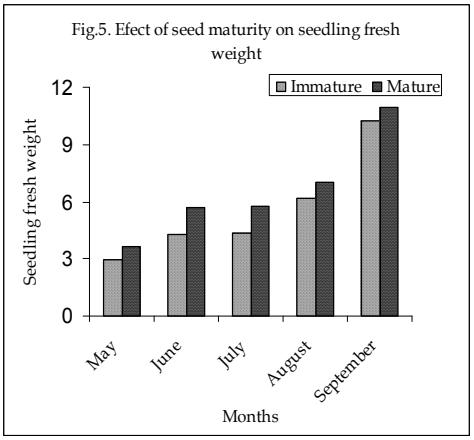
The biomass of the plant helps to build reserves for vegetative as well as reproductive growth. So, a plant with more foliage fresh weight will have more reserves and yield. Seed type and month interval as well as their interaction showed statistically significant results for seedling fresh and dry weight. Maximum seedling fresh weight was recoded in mature seeds (11.25 g) and immature seeds (10.85 g) after five months and minimum in mature seeds (2.97 g) and immature seeds (3.65 g) after one months of harvesting and maximum seedling dry weight was recoded in mature seeds (1.0 g) and immature seeds (0.93 g) after five months and minimum in mature seeds (0.25) and immature seeds (0.19 g) after one months of harvesting (Figure 5 & 6). So, the results indicated that the mature seeds improved seedling fresh as well as dry weight with the passage of time.

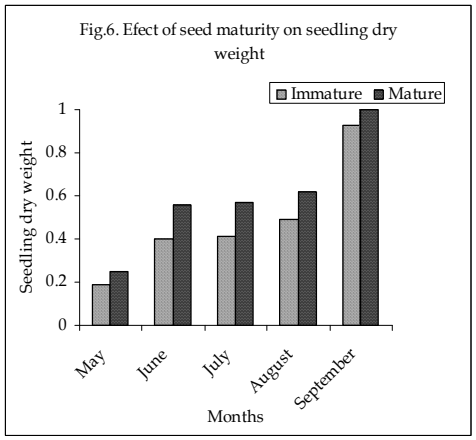












CONCLUSION

Results indicated that the vigour of pea seeds improved with the passage of time, at room temperature after harvesting. Performance of mature seeds was comparatively better than immature seeds, which indicate that physiologically matured seeds can be stored at room temperature as compared to immature ones. Results signify the importance of spot picking of physiologically mature seeds instead of single harvest in peas. Furthermore, three fold increase in vigour indicated that some period is required by seeds of pea cultivar Meteor after harvest to express its full vigour.

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