

# SUMMARY AND CONCLUSION



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Seed storage is a serious problem to the cultivators in tropical and subtropical countries like India where high temperature and high relative humidity greatly influenced the seed ageing phenomenon causing the rapid seed deterioration and non-viability of seeds. The problem of retention of seed vigour in Eastern India is much more acute because of extremely high relative humidity prevailing during the major part of a year and which is conducive to the growth of microorganism particularly fungi. As most of the crop seeds require storage for either one or several planting seasons, farmers of this region find themselves helpless with respect to maintenance of standard seed vigour under ambient storage environment.

Pulse is an important source of dietary protein especially for the predominantly vegetarian people of India. Besides protein, it is also a good source of carbohydrate, mineral and fats. Field pea being one of the important pulse crops has 22.5% protein, 62.1 % carbohydrate, 1.8 % fat. Deterioration of seed quality is an undesirable attribute of agriculture. Annual losses of revenue from seed /grain products due to deterioration can be as much as 25% of the total harvested crop. Due to insufficiency of good quality seeds and poor storage facility available at the farmer's level, total acreage and productivity of field pea in India is still frustrating while comparing the same with the other developed countries of the world.

Several studies have been made by research workers to find out the exact mechanism of seed deterioration and the possible measures to minimize the deterioration since seed deterioration is inexorable and the best can be done to control its rate. Efficacy of several classes of chemicals viz. hormones, retardants, redox chemical, phenols, vitamins , salts , pharmaceutical product and crude plant materials as well as seed priming have been established by several research workers over the years.

Keeping the aforesaid background in mind the present study was taken up to develop a simple and inexpensive cum eco-friendly method of seed invigoration treatment and suitable storage medium which would enable our farmers to maintain the vigour, viability and yield potential of the stored field pea seed. In the present experiment the

efficacy of different dry and wet treatments were tested both under pre and mid storage condition through physiological, biochemical analysis and field performances of the seed. Efforts were also made to review the additional effect if any due to using different seed size and also the compatibility of different pesticide in combination with several dry dressing treatments.

The major finding of the study conducted in the laboratory and the field are briefly presented hereunder.

i) Harvest fresh field pea (cv. Rachna) seeds were stored in different types of containers viz. glass bottle, metal bin, polyethylene packet, cloth bag and gunny bag to compare the performance of those seeds in terms of germinability and vigour under different storage condition. Data on germination percentage, root and shoot length was recorded every one month interval. It was observed that the germinability of the seeds stored in the cloth bag and gunny bag drop down drastically during peak monsoon period i.e. July- September due to high relative humidity and temperature. By the mid of November when the crop was ready to be sown in the field , it was noticed that the seed stored in the glass bottle and metal bin could retain the germinability and vigour satisfactorily than the seeds stored in polyethylene packet, cloth bag and gunny bag. Thus it may be suggested to the farmers of this region to store their seed in an air tight container (glass bottle/ metal bin) after proper drying.

ii) Dry dressing treatments were given to the harvest fresh properly dried field pea (cv. Rachna) seeds with pharmaceutical product viz. aspirin @ 50mg/kg , chemicals (bleaching powder, calcium carbonate and iodinated calcium carbonate @ 2g/kg of seed) , crude plant materials (red chilli powder @ 1g/kg of seed and amla fruit powder @ 2g/kg of seed) . Wet treatment viz. soaking-drying , moist-sand conditioning drying , moist-sand conditioning soaking-drying were also employed simultaneously. Treated seed did not show significant beneficial effect on germinability over the untreated control when tested immediately after the treatment. But after accelerated ageing it was found that all the dry dressing treatment showed better results on germinability along with vigour index over the untreated control. Among the wet treatment moist sand conditioning drying treatment

performed better results in maintaining the viability as well as vigour of the seedlings. Pre-storage dry physiological treatment with red chilli powder @ 1g/kg of seed and amla fruit powder @ 2g/kg of seed were much effective in controlling seed deterioration during storage period. It was also found that pre storage soaking-drying treatment had negative impact on germinability probably due to imbibitional injury occurring during execution of treatment.

Crop raised from the treated and untreated seeds showed that all the dry and moist sand conditioning drying treatment has shown greater plant population per square meter, increased number of pod per plant, higher yield per unit area and 1000 seed weight than untreated control. The performance of red chilli powder and amla fruit powder as seed dressing material however proved to be best among the all.

iii) Mid storage dry dressing and wet treatments were given to 4 months old seed employing chemicals, pharmaceuticals and crude plant materials as formulated in the pre-storage seed treatment. Germination percentage and vigour of the seedlings did not show any significant difference between treated and untreated seeds when the test was conducted just after the treatment. But after subsequent accelerated ageing, mid storage dry dressing treatment with amla fruit powder @ 2gm/kg of seed and wet treatment viz. moist sand conditioning soaking-drying treatment proved effective in maintaining germinability and vigour index than untreated control.

Crop raised from the mid storage treated and untreated seeds revealed that dry dressing with amla fruit powder @ 2g/kg of seed and moist sand conditioning soaking-drying treatment significantly increased yield and yield attributes than the untreated control.

iv) The compatibility of dry physiological treatment (red chilli powder, aspirin and amla fruit powder) with pesticidal formulations (thiram, *trichoderma viridii*, imidacloprid) on 15 days old field pea (var. Rachna) seed were studied with a view to check the physiological as well as pathological deterioration during storage. It has been found that most of the dry physiological treatments were effective in improving the germinability and field performance. A marginal beneficial effect of the seed protectants were also recorded on germinability and productivity over the untreated control. But their value

never exceeded the value of the dry physiological treatment. An additional beneficial effect on both germinability and field performance was recorded when seeds were formulated with red chilli powder and or amla fruit powder in combination with pesticide (thiram).

v) Different sized seeds were graded into large, medium and small size to review the influence of seed treatment and the efficacy of seed size for improved germinability and field performances. Graded seeds were dry dressed with red chilli powder, bleaching powder, aspirin and amla fruit powder to examine the beneficial effect on the storability and field performance. Germination test conducted immediately after the treatment (before ageing) did not show any effect on germinability when dry dressing treatments were given to three categories of seed size in respect to their untreated control. But after ageing, all the dry treatments given to three different seed sizes showed significant improvement on vigour and viability over their respective control. It has also been noted that large sized seed performed extended germinability, vigour and increased productivity over the medium and small sized seed. Besides, large sized seed when treated with red chilli powder and amla fruit powder rendered further beneficial effects in terms of greater storability and field performance. It was also noticed that treatment effects are independent of seed size.

vi) Seed vigour bio-assay test was conducted to quantify the vigour of different treated and untreated field pea seeds (stock seed) under laboratory condition where high vigour jute seed was used as a bio-assay material. The emanation of toxic volatile aldehyde by the treated seed was not significant under before ageing condition thereby not affecting the growth of the bioassay material (jute seed) in a greater way. After accelerated ageing, stock seeds produced higher volatile aldehyde affecting the seedling growth of the high vigour jute seeds. Among different treatments, seeds treated with red chilli powder followed by amla fruit powder showed lower of volatile aldehyde production which in turn less affected the growth of jute seed (bio-assay material).

vii) Bio-chemical test conducted just after the treatment did not show any significant difference over the untreated control. After accelerated ageing most of the dry treated seeds and few wet treatments, especially moist sand conditioning soaking-drying has shown lower leaching of electrolytes, leaching of free soluble sugar, free amino acids, reduced lipid peroxidation activity and volatile aldehyde production than untreated control. The enzymatic activity viz. amylase, catalase, peroxidase and dehydrogenase were significantly higher in all the dry and few wet treated seeds than the untreated control. Non-enzymatic anti-oxidant viz. total phenol and free phenol content and DPPH free radical scavenging activity has been found to be higher in the red chilli powder and amla fruit powder treated seeds than untreated control.

viii) Protein fractions of seeds analyzed by SDS-PAGE immediately after treatments indicates that there was a total of 17 polypeptide bands of diverse molecular weight ranging from 18 KDa to 116 KDa . Seeds treated with red chilli powder had maximum 17 number of peptide bands where as the protein sample of the seeds treated with soaking-drying had minimum of 11 peptide bands where as untreated control had 12 peptide bands. In contrast to pre storage seed invigoration treatment, after accelerated ageing , seed sample had a maximum of 14 polypeptide bands of diverse molecular weight ranging from 14.4 to 66 KDa reflecting a decrease in the total number of bands. Maximum 14 number of peptide band was observed in the sample treated with red chilli powder where as a minimum of 8 and 9 number of polypeptide bands have been noticed in the soaking-drying treatment and control respectively . The results indicate that pre-storage seed treatments, especially red chilli powder followed by amla fruit powder maintain higher number of polypeptide bands than the untreated control.

### **Practical significance/ Proposition**

On the basis of the findings of the present investigation, pre-storage dry physiological treatments in high vigour seed with red chilli powder @ 2g/kg of seed, amla fruit powder @ 1g/kg of seed, Iodinated calcium carbonate @ 2 g/kg of are suggested for maintaining storability and field performance and productivity of stored field pea seed. If the seeds are of medium vigour in quality then mid storage dry treatment with amla fruit powder

@ 2g/kg of seed, red chilli powder @ 1g/kg of seed as well as wet treatments, especially moist-sand conditioning soaking-drying may be recommended for maintaining germinability and productivity of field pea seed. If situation demands, seed protectants (thiram) could safely be combined with the dry physiological treatment to check physiological as well as pathological deterioration of seed. Besides, large sized (bold) seeds treated with red chilli powder (1 g/kg of seed) or amla fruit powder (@ 2g/kg of seed) as a pre-storage dry treatment may be practiced for improved storability and field performance of field pea.