

Dehydrogenase Enzyme Level and Seed Qualities in Green Soybean Seeds Produced under Different Planting Dates

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Abstract

Effect of planting date on seed quality and dehydrogenase enzymes level of green seed in two soybean varieties, CM. 60 and SJ. 5, were determined on different planting date during dry season after rice in northern of Thailand. The experiments were conducted on early planting date (Nov. 9), traditional or local planting date (Jan.5), late planting date (Jan.20), and in growth chamber (during maturation period) under the temperature 30°/40° C (night/day) without watering. Green seed percentage, 100 seed weight, standard germination test, tetrazolium test and formazan optical density were investigated. The result showed that planting on early planting date had the better seed quality than planting on other planting dates and in the growth chamber. It showed higher germination percentage in both yellow seed (95.8%) and green seed (56.5%). Early and late planting date resulted the lower green seed percentage than traditional planting date (1.24%, 4.08% and 21.54%, respectively). Planting the seed on early and traditional planting date also resulted higher viable seeds than on the late planting date. In addition, yellow soybean seeds found to contain higher quality than those green seeds. The seed viability and the amount of existing dehydrogenase enzymes had a very positive correlation which can be concluded formazan extraction technique could be able to evaluate the seed viability and indicate the dehydrogenase enzymes existence in soybean seed.

Keywords : dehydrogenase, Planting Date, Soybean, Seed quality

Introduction

Seed production in Thailand are mostly planted after rice in dry season. The planting date is December to early January in every year (Kallaya and Kadeonn, 1987). The harvesting time is approximately in the middle of April, which is very dry period and contains high temperature. This condition can reduce the quality of seed (Green et al., 1965). If the seed faces high temperature during meturation, they loss their moisture content rapidly (Wolf and Cawan, 1971) or gets drying very fast (Adam et al., 1983) and affects on germination ability, vigor and also causes production of immature seeds (Adam and Rinne, 1981). Besides this, this situation inhibits the enzyme which in responsible for germination (Adam et al., 1983) affects of the equilibrium efficiency of seed mitochondria toward to reduction of enzyme which is concerned about respiration (Benley and Black, 1983). Dehydrogenase enzyme which exists in mitochondria and necessary for respiratory process (Copeland, 1976; Benley and Black., 1983) and it is generally expected that the level of dehydrogenase enzyme can refer the level of viability of seed (ISTA, 1985). The objective of this research is to determine the effect of

planting date on seed viability. The existence of dehydrogenase enzyme during seed development in dry period and high temperature.

Material and Method

This experiment was conducted in both in the laboratory of Agronomy, Faculty of Agriculture, Chiang Mai University and at the farmers seed production area belongs to Hang Dong district under the Chiang Mai province, Thailand. The two varieties SJ.5 and CM. 60 were used and the experiment was carried out in split plot design. The varieties of soybean and late plantation were considered as subplot and mainplot respectively. 5 January (early January) was regarded as normal or traditional planting date and 20 January as late planting date. Harvesting and threshing were done by hand at reproductive phase 5 to 8 (R₅- R₈) by two days interval. In every sample, 100 seeds were taken from each plant.

Temperature and RH were recorded from the beginning of seed development to harvesting (R₅- R₈). Seed moisture was determined by air oven method. Vigor test was done by tetrazolium test (TZ 1.0%. at 42°C for 6 hrs.) and formazan concentration was determined by formazan extract technique.

Seed moisture content

In both varieties, degradation of seed moisture content in normal plantation was found slower than the late plantation. Especially during seed maturation, seed decreased their moisture content very rapidly in both varieties and at the end of maturation, the seed moisture content was found 20-30% and 20% in the variety CM. 60 and SJ. 5 respectively.

Percentage of seed viability

At the beginning of seed development, there was a significant increase in seed viability in both planting date and the increasing continued until reaching at the high level and became almost constant. During seed maturation and when the seeds were passing physiological maturation, their viability seemed to be decreased gradually, which is similar to the report of Copland (1976).

Formazan optical density

The value of optical density of formazan which was extracted following the technique of Sung and Chen (1988) showed that at the beginning phase of seed development, in both planting dates for seed production (Fig 3). Therefore, at the beginning of seed development phase, both seed planting dates react to formazan formation similarly by showing the density of formazan in a mostly same level then the concentration will degraded when the seed moisture started to reduce. When the seed moisture content was 65 %, the concentration of formazan increased and the rate of increasing in concentration is in linear correlation with time. (ISTA, 1985) stated that the formazan from tetrazolium test could indicate the activities of dehydrogenase enzymes which are very specific for viability and germination. Therefore, at the beginning of seed development phase, there was some dehydrogenase enzymes which existed at the level of no significance difference in both planting dates. The differences will show clearly at the maturity phase which early planting date affected the rapidly increasing the activity of dehydrogenase enzyme whereas late planting show slower trend.

Early seed development phase, the result showed the decreasing of low amount of dehydrogenase enzyme. After some period of development there was an markedly increasing of this enzyme and its activity which related to the decreasing of seed moisture during maturation. Therefore if there is a necessity for using immature seed. At its maximum level they slow drying seed, fast drying may injure the seed and affect their enzyme activities (Adam et al., 1983)

Conclusion and suggestion

Seed dehydrogenase enzymes are corrected to the decreasing of seed moisture. Seed moisture also very sensitive to the atmospheric temperature during maturation. Therefore optimum planting date is very important to soybean seed production, harvesting time should not faced to very high atmospheric temperature which induce fast drying and affect the germination enzymatic activity. Formazan extraction technique is proved in this experiment that this technique could be suggested to determine the amount and activity of existed dehydrogenase enzymes in soybean.

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