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**Development of Suitable Drying Method for Good Quality Seed of Soybean
in Thailand**

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Abstract

Suitable drying methods for good quality seed was investigated. Two pod drying methods were practical. Oven drying at 40 °C and drying in the shade. Soybean var. CM. 60 was used and then studied seed drying characteristic and determined the seed quality at the Department of Agronomy, Faculty of Agriculture, Chiang Mai, Thailand. The results showed that shade drying results in no green and hard seeds. Seed vigor tested by Electrical conductivity showed that the oven drying was less vigorous than shade drying. Seed germination on the artificial oven drying method was highly decreased compare to the shade drying method. However, oven drying method reduced seed moisture content to safety moisture levels (9 %MC) in 8 days whereas shade drying needed more than 20 days.

Introduction

Soybean seed production is not sufficient for farmer in Thailand. The government seed center can produce only 10 % overall of good seed for the farmer and the private sector is getting started. Because of high cost for producing good quality soybean seed, the farmer must stored seed for the next cropping season by himself and they always experience the problems of proper seed production and poor storage. Seed moisture content is the major cause of these problems. From the report of Vearasilp(1993) it was found that in dry season, drying of soybean seed on field terrace was due to high temperature from the ground of 50-60 °C and it can be reduce the seed viability. Most farmer in northern Thailand often pre-dries the seed in the field for 2-3 days until moisture content was decrease down to 15 % (Sittipong and Thavonum, 1998). Pre-drying was left harvested soybean plant on the field terrace like Indian tent and pile up on dick around rice field that can be accelerated seed deterioration (Poosub, 1990). There have been using artificial drying method by air oven for soybean and have a large number of immature soybean seed. Moreover, Thomson (1997) did not find any difference of seed qualities between sunshine drying and artificial method. On the other way, Burdett (1977) found that leaving soybean plant in the shade after harvest gave better seed quality than leaving in the field. When the soybean plant leaving in the field, it faces various adverse environment condition which increase infection of several

diseases. Hence, this study was undertaken in order to find out the suitable drying method for soybean seed production.

Materials and methods

Soybean seed variety ChiangMai60 (CM60) was selected and harvested at R7 stage (87 DAF). It was reached its physiological maturity. This experiment was design in split plot with 4 replication. Day of number of drying days (1, 2 and 3 days) were main-plot and drying method is sub-plot. Two drying methods were shade drying and oven drying at 40 °C (140 °F). Sample size was 500 g of soybean pods. Moisture content was recorded by various times of determining. Seed qualities were then investigated until their moisture content decrease to 10 %. Seed quality was determined by the follow methods: *Seed characteristic by good seed percentage and 100 seed weight*

Seed moisture content (ISTA, 1985)

Seed germination test (ISTA, 1985)

Seed vigor by electrical conductivity test (Perry , 1981)

Statistical analysis: Analysis of variance (ANOVA) was used for analyses the effect of drying method on seed quality after drying and comparison of mean was done by least significant difference (LSD)

Results

Pod and seed moisture content: At 56 hours, drying by artificial method could rapidly reduce the seed moisture content up to 25.16 % but shading method took a long time of 104 hours to decrease seed moisture content (figure1). In figure 2, it was showed that the decreasing of seed and pod coat moisture content at 75 % down to 18% and can be reduce more rapid than seed was 58 % down to 25% at 104 hours and slowly decrease.

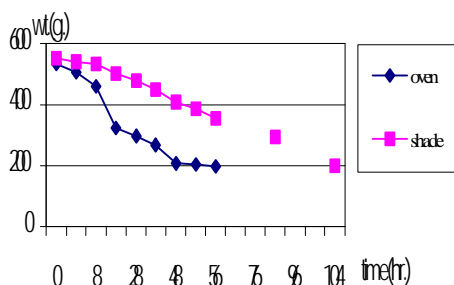


Fig 1 Changing of soybean pod weight after drying

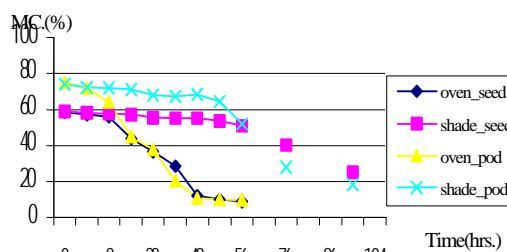


Fig 2 Changing of soybean seed and pod after drying

Percent of good seed and seed weight: Soybean seed after shade drying was contain 16.64 g of 100 seed weight that more than seed of air oven drying was 15.35 g.. For seed characteristic (Table 1), highly significant difference was found between two methods and among the period of drying time. About shade drying has found that give a better seed than the other was 85.33 and 74.11 % that was effect by heat treatment of air oven to be a lot of immature seeds.

Seed germination and Electrical conductivity: From table 2, it was revealed that seed germination percentage between two drying methods was not significantly different. However, electrical conductivity showed highly significant difference. After drying by air oven, the value of seed conductivity was continually increased from 38.17 to 39.29 $\mu\text{mhos/g}$. in 2nd days and finally at the 3rd days it became the highest 41.50 $\mu\text{mhos/g}$. Drying by shade showed the low electrical conductivity value from 32 to 34 $\mu\text{mhos/g}$ in

3 days. It means that shade drying can keep up higher vigor of seed than artificial method at 40 °C temperature, because it showed less leaching from the seed.

Table 1 Percent of good soybean seed after drying 1, 2 and 3 days

Day after drying (days)	Percent of Good seed(%)		
	Air-oven	shading	Average
1	77.78	86.56	81.83
2	73.93	83.27	77.83
3	72.01	87.71	79.50
Average	74.11	85.33	
F-test	**		
LSD _(0.05) time	4		
LSD _(0.05) trt	11.22		
CV(%)	3.98		

Table 2 Soybean seed quality after drying 1, 2 and 3 days

Day after drying (days)	Germination percentage(%)		Electrical conductivity (µmhos/g.)		
	Air-oven	Shading	Air-oven	Shading	Average
1	83	93	38.17	32.26	34.67
2	85	75	39.29	35.83	35.83
3	91	66	41.50	37.50	37.50
Average	-	-	39.11	32.38	
F-test	NS		**		
LSD _(0.05) time	-		1.64		
LSD _(0.05) trt			6.22		
CV(%)	9.13		1.74		

Discussion

Data show that high temperature of 40 °Celsius of air oven can be rapidly reduce high seed moisture from 50 % down to 25 % in time of our control that was 3 days. From the percent of good seed in each time and each method of drying was effect to seed morphology. Drying by shade in 3 days gave the highest percent of normal seed by 87.71 percent but drying by air oven gave 72.01 percent and while the remaining another were immature seeds. That means that hot temperature in short time effect on seed quality by inhibiting the physiological maturity. According to the study of Vearasilp *et al.* (1993) drying of harvested soybean seed by shade and sunlight can disturb the maturation and as a result immature seed produces. Because, immature seed dehydrates by heat temperature in a few time and that is why its green color can not be changed into yellow color. However, some soybean that left in shade dried slowly and developed to physiological maturity stage. High temperature continually effected on germination and conductivity, which were the index of seed viability, and seed vigor could be decreased. Because of fast drying by air oven which affects to germination, chemical component and enzyme activity it is different from slowly drying. Moreover, heat treatment breaks cell wall and can not contain chemical compounds resulting and seed coat cracking which affects to leaching of leakage (Copeland, 1976)

Conclusion

The two drying methods oven drying and shade drying does not affect on seed germination of soybean. However, heat treatment by air oven drying can affect adversely on soybean seed by reducing its vigor. Moreover, immature seed production and cracking of seed can be occurred.

Acknowledgments

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