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A STUDY OF DRYING, THRESHING AND STORAGE  
CONDITIONS ON THE VIABILITY OF SOYBEAN  
SEEDS WITH A SUPPLEMENTARY STUDY  
OF THE EFFICIENCY OF A SIMPLE  
DRYING METHOD DEVELOPED.

A THESIS PRESENTED IN PARTIAL FULFILMENT OF  
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## ABSTRACT

This study was designed to investigate the relevance of post-harvest factors in maintaining the viability and storability of soybean seeds. In order to obtain high quality seeds for the drying and storage aspects of the experiment, the sequence of seed development and physiological maturity of the crop was investigated to ascertain maximum viable seed yield. The soybean cultivar 'V-53' was sown and plants were randomly sampled at 32 days after peak flowering, and subsequently every 5 days until the seeds reached physiological maturity. The changes in seed moisture content, fresh weight, dry weight, percent germination and maximum viable seed yield in relation to time after peak flowering were measured. The soybean crop achieved a maximum viable seed yield of 1344.1 kg/ha 77 days after peak flowering. The development of the crop was prolonged by adverse weather conditions. After soybean seeds reached physiological maturity, the crop was harvested at a seed moisture content of 49.2% and germination of 96%.

Further studies were carried out to investigate those factors that affect seed viability before and during storage. The drying effect on seed viability was made by comparing the effect of 6 different drying methods i.e. dehumidification, refrigeration, ambient air and heated air at 30°C, 40°C or 50°C. Seeds were dried to 8% moisture content in each case. Delays between harvest and the commencement of drying operations result in a decline of seed germinability, particularly in seedlot which was later used in the refrigeration drying system. Although drying method had no immediate effect on seed viability during drying, drying seed by refrigeration method was time consuming the drying rate being too slow and resulting in subsequent seed deterioration. The heated air methods were most efficient in assisting removal of moisture from the seed. Following drying, seeds were threshed from the pods by hand threshing or beating threshing methods. Seeds from different drying and threshing treatments were stored under 20°C - 40%RH or 35°C - 90%RH conditions for 16 weeks. The threshing of seed using a beating method caused a significant reduction in seed germinability when compared to the hand system used to remove seed

from the pod. Drying method had no significant effect on seed storability when seeds were stored under good storage conditions i.e.  $20^{\circ}\text{C}$  - 40%RH. However, when seeds were stored under poor storage conditions i.e.  $35^{\circ}\text{C}$  - 90%RH, seeds previously dried at  $40^{\circ}\text{C}$  and  $50^{\circ}\text{C}$  using heated air showed a more severe drop in germination after only 2 weeks when compared to seeds dried by  $30^{\circ}\text{C}$  heated air. The effect of unheated air on seed storability was possibly not detected since there was wide variation in the results and the storage conditions of  $35^{\circ}\text{C}$  - 90%RH had severely affected seed viability after only 4 weeks storage. Seeds stored under  $35^{\circ}\text{C}$  - 90%RH conditions rapidly gained moisture to a relatively high level. This high moisture content in seeds accelerated the rate of deterioration and favoured the growth of storage fungi which were greatly responsible for loss of viability. Although there was a reduction in the germination capacity of seed stored under  $20^{\circ}\text{C}$  - 40%RH conditions after 16 weeks, these conditions were vastly superior to storage conditions of  $35^{\circ}\text{C}$  - 90%RH. In the present study, the effect of drying method was not as important as storage conditions in maintaining seed viability. However, with proper harvesting, drying and threshing the problems of maintaining high level of seed viability could be eliminated.

A separate drying experiment was carried out to evaluate the possible use of the 'Kiwi' drier and its efficiency in drying various seed crops. The 'Kiwi' drier was designed at the Seed Technology Centre and consists of a cylindrical metal drum containing 2 metal tubes filled with silica gel as a dessicant. As presently constructed the drier resulted in very slow and inefficient drying of barley, pea and Tama ryegrass seeds. However, results suggest that by redesigning certain features in the 'Kiwi' drier to improve air circulation and increase the area of close contact between the silica gel and the seeds its seed drying efficiency could be greatly improved. In addition, the 'Kiwi' drier provides an ideal storage container for seeds in tropical climates.

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## TABLE OF CONTENTS

	Page
Abstract	i
Acknowledgement	iii
Table of Contents	iv
List of Tables	vii
List of Figures	ix
List of Plates	xi
List of Appendices	xiii

GENERAL INTRODUCTION	1
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## CHAPTER 1

A STUDY OF SEED DEVELOPMENT AND HARVEST RIPENESS IN SOYBEAN SEED	2
1.1 INTRODUCTION	3
1.2 REVIEW OF LITERATURE	4
1.2.1 Seed Development	4
1.2.2 Seed Maturation	5
1.3 MATERIALS AND METHODS	8
1.4 RESULTS AND DISCUSSION	11
1.5 CONCLUSION	16

## CHAPTER 2

## PART A

A COMPARISON OF 6 DRYING SYSTEMS AND THEIR EFFECT ON SEED VIABILITY	17
2.1 INTRODUCTION	18
2.2 REVIEW OF LITERATURE	19
2.2.1 Principles of Seed Drying	19
2.2.2 Methods of Drying Seeds	20
a. Heated air method	20
b. Dehumified air method	21
c. Refrigeration method	21
2.2.3 Drying effects on Seed Viability	21

2.3	MATERIALS AND METHODS	24
2.3.1	'Mini' Drier	24
2.3.2	Drying treatments	25
2.4	RESULTS	28
2.4.1	Seed Germination Percentage Before Commencing Drying	28
2.4.2	Changes in Seed Moisture Content during Drying	28
2.4.3	Effect of Drying Methods on Seed Viability during the Drying Process	29
2.5	DISCUSSION	33
2.6	CONCLUSION	35

## PART B

	A STUDY OF THE DRYING PERFORMANCE OF THE 'KIWI' DRIER ON TAMA RYEGRASS, BARLEY AND PEA SEEDS	37
2.7	INTRODUCTION	38
2.8	MATERIALS AND METHODS	39
2.9	RESULTS AND DISCUSSION	44
2.9.1	Moisture Content of Silica Gel in Equilibrium with Different Relative Humidities	44
2.9.2	Drying Performance of Tama Ryegrass in the 'Kiwi' Drier	44
2.9.3	Drying Performance of Barley Seeds in the 'Kiwi' Drier with Continuous Turning	45
2.9.4	Drying Performance of Pea Seeds	45
a.	Drying performance of pea seeds in the 'Kiwi' drier	45
b.	Drying performance of pea seeds in the 'Kiwi' drier with battery fan	46
c.	Drying performance of pea seed in the 'Mini' drier with a column of silica gel	
2.9.5	Drying Trial Using a Closed Contact System with Barley Seeds and Silica Gel	46
2.10	SUMMARY	48

## CHAPTER 3

THE PERFORMANCE OF SOYBEAN SEED UNDER DIFFERENT STORAGE CONDITIONS	49
3.1 INTRODUCTION	50
3.2 REVIEW OF LITERATURE	51
A. STORAGE AND VIABILITY OF SEED	51
3.2.1 Inherent Characteristics	51
3.2.2 Quality of Seed Entering Storage	51
3.2.3 Seed Viability and Storability as Affected by Field Environment	52
3.2.4 Seed Viability and Storability as Affected by Mechanical Damage	53
3.2.5 Effects of Storage Conditions on Seed Longevity	56
3.2.6 Storage Fungi and Seed Deterioration	59
B. GERMINATION AND SEEDLING EVALUATION	62
3.3 MATERIALS AND METHODS	64
3.4 RESULTS	68
3.4.1 Effect of Storage Conditions on Moisture Content	68
3.4.2 Effect of Threshing on Normal Germination	73
3.4.3 Effect of Drying on Germinability of Soybean Seeds Stored at 20°C - 40%RH	79
3.4.4 Effect of Drying on Germinability of Soybean Seeds Stored at 35°C - 90%RH	79
3.4.5 Changes in Seed Germinability after Harvest, Drying and Storage	83
3.4.6 Storage Fungi	87
3.4.7 Abnormal Seedlings	87
3.5 DISCUSSION	96
3.6 CONCLUSION	100



## LIST OF TABLES

	Page
2.1 Comparison of time taken and the germination of soybean seed dried by different methods	30
2.2 Moisture content of silica gel in equilibrium with different levels of relative humidity	44
2.3 Moisture reduction rate of barley seeds	46
3.1 Initial moisture content of seed prior to storage	69
3.2 Effect of storage conditions on seed moisture content during 16 weeks storage	69
3.3 Mean percentage of normal germination (mean of 6 drying methods) as affected by threshing method and storage at 35°C - 90%RH	74
3.4 Mean percentage of normal germination (mean of 6 drying methods) as affected by threshing method and storage at 35°C - 90%RH	74
3.5 Percentage of normal germination of soybean seeds dried by 6 drying methods, hand threshed and stored at 20°C - 40%RH	81
3.6 Percentage of normal germination of soybean seeds dried by 6 drying methods, beaten threshed and stored at 20°C 40%RH	81
3.7 Percentage of normal germination of soybean seeds dried by 6 drying methods, hand threshed and stored at 35°C - 90%RH	82

- |      |   |    |
|------|---|----|
| 3.8  | Percentage of normal germination of soybean seeds dried by 6 drying methods, beaten threshed and stored at 35 <sup>0</sup> C - 90%RH        | 82 |
| 3.9  | Effect of threshing method on the percentage of abnormal seedlings produced by seeds stored at 20 <sup>0</sup> C - 40%RH for up to 16 weeks | 95 |
| 3.10 | Effect of threshing method on the percentage of abnormal seedlings produced by seeds stored at 35 <sup>0</sup> C - 90%RH for up to 16 weeks | 95 |

## LIST OF FIGURES

	Page
1.1 Changes in moisture content percentages, fresh and dry 100 seed weight (g) in relation to days after flowering	12
1.2 Seed yield (dry wt.) per plant and seed yield (dry wt.) per hectare in relation to days after flowering	12
1.3 Germination percentage during seed development	15
1.4 Viable seed yield (dry wt. kg/ha) in relation to days after flowering	15
2.1 Changes in seed moisture content and the time taken for seed to reach the desired 8% moisture content in different drying treatments	31
2.2 Changes in seed germination percentage obtained during the drying of soybean seeds in 6 different drying treatments	32
3.1 Changes in the seed moisture content of seeds previously dried by the dehumidification system and stored at 20 <sup>0</sup> C - 40%RH or 35 <sup>0</sup> C - 90%RH	70
3.2 Changes in the seed moisture content of seeds previously dried by the refrigeration system and stored at 20 <sup>0</sup> C - 40%RH or 35 <sup>0</sup> C - 90%RH	70
3.3 Changes in the seed moisture content of seeds previously dried by the ambient air system and stored at 20 <sup>0</sup> C - 40%RH or 35 <sup>0</sup> C - 90%RH	71

3.4	Changes in the seed moisture content of seeds previously dried by the 30 <sup>0</sup> C heated air system and stored at 20 <sup>0</sup> C - 40%RH or 35 <sup>0</sup> C - 90%RH	71
3.5	Changes in the seed moisture content of seeds previously dried by the 40 <sup>0</sup> C heated air system and stored at 20 <sup>0</sup> C - 40%RH or 35 <sup>0</sup> C - 90%RH	72
3.6	Changes in the seed moisture content of seeds previously dried by the 50 <sup>0</sup> C heated air system and stored at 20 <sup>0</sup> C - 40%RH or 35 <sup>0</sup> C - 90%RH	72
3.7	Changes in germination of soybean seeds after harvest, during drying and storage at 20 <sup>0</sup> C - 40%RH and 35 <sup>0</sup> C - 90%RH for up to 16 weeks	84
3.8	Effect of threshing method on the type abnormality in soybean seed during 16 weeks storage (average over 6 drying treatments)	94

## LIST OF PLATES

	Page
2.1 'Mini' drier (a = Air inlet; b = Refrigeration coil; c = Heater element; d = Drying bin)	27
2.2 Silica gel tubes arranged in a diagonal cross placed inside the drum	41
2.3 'Kiwi' drier front view (a = Dial thermometer attached to one of the silica gel tubes; b = Durotherm hygrometer attached to the filler cap of another silica gel tube)	41
2.4 'Kiwi' drier end view (c = fill in seed with a Durotherm hygrometer attached to the filler cap; d = Dial thermometer to measure temperature inside the drum)	43
2.5 'Kiwi' drier side view (e = handles for turning the drum)	43
3.1 Tetrazolium staining pattern on sound seed	76
3.2 Tetrazolium staining pattern on deteriorated seed	76
3.3 Tetrazolium staining patterns on beaten-threshed seeds	78
3.4 Tetrazolium staining patterns of hand-threshed seeds	78
3.5 Abnormal seedling - hypocotyl short and thick or twisted or curled over	89
3.6 Abnormal seedlings - more than half the total cotyledonary area broken off	89

3.7	Abnormal seedling - decayed	91
3.8	Abnormal seedlings showing weak, unbalanced growth	91
3.9	Abnormal seedlings - completely shattered	93
3.10	Abnormal seedlings showing damage with evidence of damage to the shoot apex	93

## LIST OF APPENDICES

- 3.1 Experimental data of soybean seeds from different drying and hand threshing treatments, stored under 20<sup>0</sup>C - 40%RH conditions for 16 weeks
- 3.2 Experimental data of soybean seeds from different drying and beating threshing treatments, stored under 20<sup>0</sup>C - 40%RH conditions for 16 weeks
- 3.3 Experimental data of soybean seeds from different drying and hand threshing methods, stored under 35<sup>0</sup>C - 90%RH conditions for 16 weeks
- 3.4 Experimental data of soybean seeds from different drying and beaten threshing methods, stored at 35<sup>0</sup>C - 90%RH conditions for 16 weeks
- 3.5 Analysis of variance of abnormal seedling categories of seed samples at 2, 4, 6, 8, 12 and 16 weeks storage

## GENERAL INTRODUCTION

Soybean is one of the major cultivated legume crops grown in the North, Central Plain and Northeast of Thailand. Demand for soybean grains has increased rapidly over recent years due to the expansion of domestic feed and oil extracting industries and new market development in neighbouring countries. Although government policy has been to encourage expansion of the soybean acreage, its production has not met the market demand. The rapid expansion of soybean acreage resulting in a great demand for high quality seeds has become a major problem confronting local farmers in their efforts to commercialise the crop. To overcome problems arising from an insufficient supply of high quality seeds produced under government seed production schemes, farmers have been forced to store their own seed stocks. However, the traditional seed saving practices used by farmers does not retain the viability of seed from harvest until the next planting season.

The present study was undertaken to obtain more information of the problems involved in handling soybean seed after harvest. Investigations were made on seed drying aspects, the effects of threshing method and the influence of the storage environment on the viability of stored soybean seed. To produce high quality seed for the experiment, physiological maturity of soybean seeds were produced, seeds being harvested at maximum viable seed yield. Comparisons were made between the effects of 3 different heated air systems and also the use of unheated air, refrigerated air and the chemical dehumidifier drying systems.

Storage performance of seed samples which had been subjected to different drying and threshing treatments was studied over a period of 16 weeks in both good (cool and dry) and bad (hot and humid) storage environments.