PRE AND POST-HARVEST DETERIORATION OF SOYBEAN (*Glycine max* (L.) Merrill) SEED UNDER DRY ZONE CONDITIONS OF SRI LANKA

LIBRARY
EASTERN UNIVERSITY Sri Lanka

By

VYTILINGAM ARULNANDHY

Thesis

Submitted in partial fulfilment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in the

POSTGRADUATE INSTITUTE OF AGRICULTURE

of the

/ERSITY OF PERADENIYA

SRI LANKA

1633-84
ExPhD20
Thesis
Library - EUSL
26927

Approved.

Supervisor ..... (Prof. Y.D.A. Senanayake)

Examiner ..... (Dr. Gary Reusche)

Examiner ..... (Dr. B.C.N. Peiris)

February 1987.

PROCESSED
Main Library, EUSL

ABSTRACT

Great potential exists for increased soybean (Glycine max (L,) Merrill) production in Sri Lanka and other countries in the tropics. Constraints among tropical regions differ, but the production of quality seed under sub-optimal field conditions and maintenance of viability and vigour of seed during storage are common, critical problems for most regions.

An investigation, comprising a series of experiments, relevant to pre- and post-harvest deterioration of soybean seed was performed at the Agricultural Research Station in Maha Illuppallama. Seed viability and vigour, collectively determining seed quality or seed deterioration, were closely studied through germination tests conducted under near optimal and stress conditions.

Maximum quantity of the best quality seed was produced from plantings made in the first week of May and June under favourable climatic conditions in the field at seed maturation, particularly daily mean temperature of nearly 28°C and daily maximum relative humidity of nearly 75%. Significant inverse relationship between seed quality and these climatic factors was evident, of which daily mean temperature was found to be more effective. A short term moisture stress of 7 days from seed initiation to late seed development stage caused a significant reduction in seed quality but the greatest reduction was felt at seed initiation and seed reaching full size.

Foliar application of fungicides benomyl (Methyl 1-(butyl carbomyl) - 2 benzimedazol carbomate) and captan (N[Trichloromethyl) thio] -4- cyclohexane 1, 2 dicarboximide) before harvest significantly reduced the field weathering of seeds in some cultivars and lengthened the half-life period of seeds stored under ambient conditions by about 2 months. Harvesting a soybean crop at physiological maturity followed by drying in an open-sided shed significantly improved and delaying the harvest by 2 weeks significantly reduced the seed quality, predominantly in the wet season. A harvest delay by 4 weeks after maturity lowered the seed quality in the dry season. An interaction between cultivar and harvest time was noticed.

Good and medium quality seeds maintained significantly better viability and vigour than poor quality seeds during storage. Deterioration of good quality seeds proceeded at a slower rate than the other two. The drying of seeds to initial seed moisture content of 11.5% was found to be more appropriate than 8.5 or 15.5% for storing soybean seeds under ambient humid tropical conditions.

Seeds sealed in single and double polyethylene bags (gauge 150) showed insignificant rate of deterioration and preserved the initial viability and vigour for 9 months under ambient storage while seeds in closed can (unsealed), clay pot and paper bag deteriorated rapidly after 3 months of storage. The controlled storage, constant temperature of 20°C and relative humidity of 60%, was found to be unique in preserving viability and vigour of soybean seeds in the humid tropics. In all cases,

CONTENTS

the key factor was the seed moisture which has to be kept low, with minimum fluctuation during storage.

A decrease in protein and ash and an increase in carbohydrate, fat and free fatty acids in seeds, accompanying the loss in viability and vigour was evident; however, free fatty acids remarkably increased in deteriorated seeds. The electrical conductivity of seed leakage increased appreciably with storage duration, coinciding with the loss of seed viability and vigour.

Soybean genotypes differed significantly in viability and vigour maintenance during ambient storage in humid tropical environments and 12 out of 85 genotypes, with superior storability were identified.

This investigation hopefully provides a package of technology to ensure quality seed production and safe storage of seeds, associated with minimum deterioration. A major constraint is thus, solved in expanding soybean production in Sri Lanka and other countries in the tropics.