UNIVERSITI PUTRA MALAYSIA

STUDIES ON SEED GERMINATION, BUD ACTIVATION AND EARLY BUDSHOOT GROWRH OF HEVEA BRASILIENSIS (MUELL. ARG.)

EUGENIO A. ALCALA

STUDIES ON SEED GERMINATION, BUD ACTIVATION AND EARLY BUDSHOOT GROWTH OF *HEVEA BRASILIENSIS* (MUELL. ARG.)

by

EUGENIO A. ALCALA

A Thesis Submitted in Fulfilment of the Requirements for the Degree of Doctor of Philosophy in the Faculty of Agriculture, Universiti Pertanian Malaysia

March 1991

To my wife - Tenny

and

children - Euny
Gete
Rena
Ruby
Noel

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LIST OF ABBREVIATIONS

ABA	-	abscisic acid
a.i.	-	active ingredient
BA	-	Benzyladenine
CCC	-	Chlormequate (2-Chloroethyl) trimethyl ammonium chloride
DMSO	-	Dimethylsulfoxide
g	-	gram
GA	-	gibberellins
IAA	-	indolyl-3-acetic acid
IAN	-	Instituto de Pesquisas Agropecuarias de Norte
IBA	-	indol-3-yl butyric acid
MH	-	Maleic hydrazide
NAA	-	naphthylacetic acid
NaOH	-	sodium hydroxide
ppm	-	parts per million
TBA	-	Tertiary Butyl Alcohol

DEFINITION OF TECHNICAL TERMS

Bud-break - a bud at an advanced state of leaf primordial development

Budpatch - a piece of bark which carry a bud

Budgrafting - another term for budding

Budshoot - bud with differentiated leaves

Bud stage - a period which follow bud-break before leaves are fully open

Budded stump - a bare rooted budded seedling without the upper portion beyond the budding union

Cracking of seedcoat - partial breaking of the hard covering of the seed

Cutback - Cutting of the terminal ends of shoots or branches

Carry-over-effect - a residual effect of an applied treatment

Dormant stage - a period when the leaves have attained full maturity with dark green in color

Flushing stage - a period when the young leaves have just fully opened usually with violet to light-yellow in colour

Green budding - a method of propagation whereby the bud is inserted to the stem of another plant through an incision about 10 - 20 cm from the ground level

Green buddings - a population of green budded plants

Induction of bud-break - the process of stimulating early cambial activity with the use of growth regulating substances or other horticultural manipulations

Young budding - a method of propagation whereby younger bud with light-green in colour is inserted to a young stem of another plant through an incision about 10-20 cm from the ground level

Young buddings - a population of young budded plants

An Abstract of the Thesis Presented to the Senate of Universiti Pertanian Malaysia in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

STUDIES ON SEED GERMINATION, BUD ACTIVATION AND EARLY GROWTH OF BUDSHOOT IN *HEVEA BRASILIENSIS* (MUELL. ARG.)

by

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March 1991

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The reduction of uneven early growth of *Hevea* buddings which could overcome the problem of low percentage of tappable trees during the early years of tapping was evaluated. The investigation covered a series of studies on the germination of *Hevea* seeds; bud activation of budded stumps to induce early bud-break by using growth regulators, other techniques and other growth regulating materials; and the manipulation of early growth of *Hevea* budshoot after emergence. An anatomical study on the budpatch under the various bud activation treatments was also carried out.

Studies on the germination of seeds revealed that Hevea seeds (RRIM 600) gathered during the early seedfall had very low percentage of germination compared to those seeds gathered during the peak seedfall. However, partial cracking of the seed coat improved the percentage of germination in both groups of seeds gathered during the early and peak seedfall. It was also observed that heavier seeds (4-5 grams) germinated earlier (before 14 days from sowing), with seedlings more vigorous than those from the lighter seeds. Seedlings, from the early germinated seeds reached buddable girth size for young budding after two months from planting.

Studies on bud activation using benzyladenine at 3,500-4,000 ppm revealed that 40-60 percent early bud-break could be obtained in green and young buddings and this was significantly higher than the early bud-break of the untreated control. Similar response was obtained when different clonal materials were used in green buddings. The regulator was applied by brushing directly onto the dormant buds. Another technique observed promising for inducing early bud-break was dipping the budded stumps in melted paraffin wax at a temperature between 60 ^{o}C and 85 ^{o}C. Forty to fifty percent bud-break was obtained with this technique at three weeks after treatment.

The early shoot growth of Hevea buddings was not affected by any of the growth regulators applied onto the dormant buds. However, after bud emergence, brushing gibberellin preparation onto the shoot at bud stage stimulated rapid growth of the shoot. Significant rapid growth of shoot in height, particularly the first internode, was very evident between 15 to 30 days after the application of the chemical.

The effectiveness in the induction of bud-break by the different treatments was found to be closely associated with the early cambial activity and callus formation in stock and scion as revealed in the anatomical study of the budpatch.

The studies on seed germination, bud activation and early budshoot growth in Hevea revealed that variation in early growth of Hevea buddings can be minimized significantly through selection and appropriate treatments of seeds together with the use of growth regulators and other horticultural techniques and manipulations on the young and green buddings.

Abstrak Tesis Yang Dikemukakan Kepada Senat Universiti
Pertanian Malaysia Sebagai Memenuhi Syarat
Keperluan Ijazah Doktor Falsafah

KAJIAN KE ATAS PERCEMBAHAN BIJI, PENGAKTIFAN TUNAS DAN PERTUMBUHAN AWAL PUCUK TUNAS *HEVEA BRASILIENSIS* (MUELL. ARG.)

oleh

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Mac 1991

Penyelia: Profesor Madya Dr. Wong Kai Choo

Fakulti: Pertanian

Pertumbuhan peringkat awal tunas *Hevea* yang tidak seimbang yang secara langsung berhubung dengan masalah peratus yang rendah popok-pokok yang boleh ditoreh semasa penorehan di peringkat awal telah dinilai. Penyiasatan ini meliputi beberapa kajian ke atas percambahan biji *Hevea*, pengaktifan tunas tunggul-tunggul cantuman untuk mengaruh pemecahan tunas yang awal dengan penggunaan bahan-bahan pengawalatur, dan teknik-teknik lain dan juga meminda pertumbuhan pucuk tunas di peringkat awal. Kajian anatomi ke atas keping tunas di bawah keadaan berbagai rawatan pengaktifan tunas telah juga dijalankan.