



UNIVERSITI PUTRA MALAYSIA

**EFFECTS OF TEMPERATURE ON RUBBER
(HEVEA BRASILIENSIS MUELL.-ARG.) SEED STORAGE**

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EFFECTS OF TEMPERATURE ON RUBBER
(HEVEA BRASILIENSIS MUELL. -ARG.) SEED STORAGE

by

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Dedicated to

FAIZ HADI

ILI FARHANA

MOHAMED



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MUELL. -ARG.) SEED STORAGE

by

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Co-Supervisor : Hor Yue Luan, Ph. D.

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The effects of temperature on the storage of Hevea seeds and embryonic axes were studied.

The first part of the study was on the effects of temperature (10, 22 and 27°C) on physiological, biochemical and structural changes during imbibed storage of Hevea seeds. The second part of the study involved the effects of temperature (10, 22 and 27°C) on storability of Hevea seeds using a modified imbibed storage method incorporating the application of 10 percent and 20 percent concentrations of a germination inhibitor (PEG) and a dry storage method in the presence of a fungicide (0.3 percent Benlate). The third part of the study was on in vitro storage of Hevea embryonic axes including a



slow growth method (at 10, 15, 18 and 20°C) and cryopreservation in liquid nitrogen (-196°C).

In the first part of the study, there was a decrease in percentage germination, seedling height, seedling dry weight, respiration rate and total lipid composition and an increase in leachate conductivity as duration of storage increased. Membrane degeneration appeared to be the most common ultrastructural feature of deterioration. Viability of imbibed Hevea seeds was maintained longest when the seeds were stored in perforated black polythene bags at 27°C (ambient temperature).

Ambient temperature (27°C) was also the best storage temperature in the modified imbibed storage and for dry storage. Ten percent and 20 percent PEG did not improve the storability of seeds. The dry storage method in the presence of Benlate as a fungicide resulted in better storability of Hevea seeds than imbibed storage at 27°C (13 months, percentage germination 20 percent).

In vitro storage of Hevea embryonic axes was a new method investigated. The slow growth method using temperatures of 10, 15 and 18°C was not successful. Storage at 20°C resulted in survival period of about five months. However, the potential for long term storage of Hevea embryonic axes was shown, when desiccated axes survived liquid nitrogen storage (-196°C) using



various cooling and thawing treatments. Normal growth and development of seedlings from the cryopreserved axes were observed.



Abstrak tesis yang dikemukakan kepada Senat Universiti Pertanian Malaysia sebagai memenuhi sebahagian daripada syarat-syarat keperluan untuk ijazah Doktor Falsafah.

KESAN SUHU KE ATAS PENYIMPANAN BIJI BENIH GETAH
(HEVEA BRASILIENSIS MUELL. - ARG)

oleh

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Oktober 1987

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Kesan suhu ke atas penyimpanan biji benih dan paksi embrio Hevea telah dikaji.

Bahagian pertama kajian ini adalah kesan suhu (10, 22 dan 27°C) ke atas pertukaran fisiologi, biokimia dan struktur semasa penyimpanan pedap biji benih Hevea. Bahagian kedua meliputi kesan suhu (10, 22 dan 27°C) ke atas penyimpanan biji benih Hevea dengan menggunakan cara penyimpanan pedap terubah-suai dengan penggunaan perencat percambahan (PEG) pada kepekatan 10 peratus dan 20 peratus dan dengan menggunakan cara penyimpanan kering beserta rawatan racun kulat (0.3 peratus Benlate). Bahagian ketiga ialah kajian ke atas penyimpanan in



in vitro paksi embrio Hevea yang meliputi cara pertumbuhan perlahan (pada 10, 15, 18 dan 20°C) dan krioawetan dalam nitrogen cecair (-196°C).

Dalam bahagian pertama kajian ini peratus percambahan, ketinggian dan berat kering anak benih, kadar respirasi dan komposisi lipid menyusut sementara kekonduksian luluh larut meningkat semasa penyimpanan. Pemosotan membran nampaknya adalah satu ciri ultrastruktur kerosakan yang paling biasa. Daya hidup biji benih Hevea dapat dipertahankan paling lama dengan penyimpanan pedap dalam beg politena hitam berlubang pada suhu 27°C (suhu ambien).

Suhu ambien (27°C) juga merupakan suhu yang paling sesuai untuk cara penyimpanan pedap terubahsuai dan cara penyimpanan kering. PEG dengan kepekatan 10 peratus dan 20 peratus tidak memperbaiki penyimpanan. Penyimpanan kering dengan rawatan racun kulat Benlate telah menghasilkan daya penyimpanan biji benih Hevea yang lebih baik dari penyimpanan pedap pada suhu 27°C (13 bulan, peratus percambahan 20 peratus).

Penyimpanan in vitro paksi embrio Hevea adalah kajian cara penyimpanan yang baru. Cara pertumbuhan perlahan pada 10, 15 dan 18°C tidak berjaya. Penyimpanan pada suhu 20°C menghasilkan masa kemandirian selama lima bulan. Walau bagaimanapun, keupayaan penyimpanan jangka panjang paksi embrio Hevea telah

ditunjukkan apabila paksi-paksi embrio yang telah dikeringkan mandiri penyimpanan dalam nitrogen cecair (-196°C) selepas berbagai perlakuan pendinginan dan pencairan. Pertumbuhan dan perkembangan anak benih yang normal daripada paksi embrio yang dikrioawetkan telah dicerap.