PHYSIOLOGICAL AND BIOCHEMICAL STUDIES

ON POTATO TUBERS

By:

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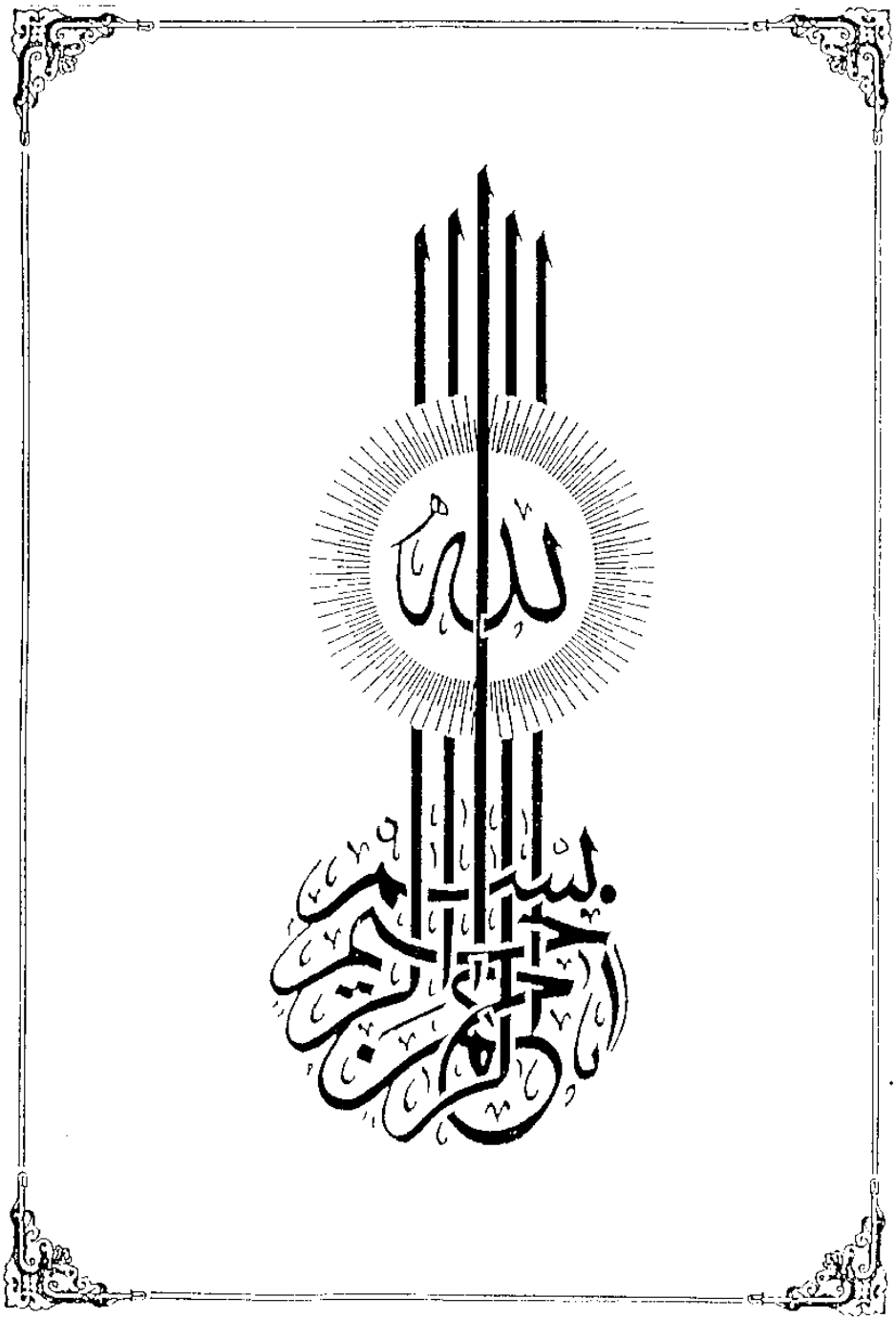

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INTRODUCTION

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Solanium tubersum is a good source of starch. In Egypt two crops of potato plants could be cultivated per year. One of them which is known as "Nile crop" is cultivated in September and harvested in December, the second designated as "Summer crop" is cultivated from January to February and harvested in Summer season. Potato tubers are usually stored in refrigirating rooms, the capacity of which is sometimes not enough for keeping all the local of the imported crops which are used for consumption & as seeds for new crops.

During the period of storage by any means, starch and other biochemical constituents of the tubers are suffering from the various metabolic changes which may cause deterioration or losses in the nutritive value of these tubers, especially when sprouting is taking place. Thus the problem with such starchy crops is how to protect their keeping quality during storage after ripening.

In this connection, it should be noticed that the storage period is usually terminated by excessive sprouting or shrinkage. Methods of storage should, therefore, be

designed to prolong the dormant period and to retard or inhibit undesirable chemical changes. Since potato is one of the most important crops widely cultivated in Egypt and our economic depends on exporting a good deal of potato, several researches are carried out to keep such a crop in a good condition, including appearance together with its nutritive value, for a long time enough to reach the consumer or to be preserved for our use allover the year. Such researches involved the use of two main methods for keeping potato tubers in a dormant state.

1. The classical method on which potato tubers are stored at low temperature "between 32 - 40°F."

2. The modern methods depends on the use of sprout-inhibiting chemicals such as maliec hydrazide, α-naphthalene acetic acid methyl ester, iso propyl n-3 phenyl carbamate and chloro iso-propyl n-3 phenyl carbamate "C.I.P.C."

Regarding the mode of action of C.I.P.C. which are used in this work, it has been reported that the chemical treatment may cause injury to potato tissues and may prevent cell division just below the cut surface of potato.

The work embodied in this dissertation will deal with the following aspects :-

1. Estimation of sprouting ratio, shrinkage rate and carbohydrates content in potato tubers as affected by the time factor during storage at 5° C.

2. Sprouting ratios, shrinkage rate and carbohydrates content in potato tubers as influenced by different concentrations of C.I.P.C. prior storage, during different times at room temperature.

3. Variation of the above mentioned quantities in Nile and Summer crops for both Alpha and cloudia varieties grown widely in Egypt.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

The literature mentioned in this dissertation will touch different aspects, so it was thought advisable to be reviewed in separate categories.

A. Use of chemicals as sprouting inhibitors

Sprouting takes place when potato tubers are stored in clamps or storage houses. This may be due to the unfavourable conditions of storage. Extensive growth of sprouts of such stored potatoes results in a rapid loss of weight accompanied by wiliting and a considerable decrease in marketing value. In this respect a method for prolonging dormancy was discovered by Guthrie (1939) when he soaked the cut base of a portion of a potato tuber for one to ten days in IAA solution (250 - 1000 pp) . The same results were obtained by cutting Irsh potatoes into pieces, each having one eye, soaking 10 grams for two or more days at 50°f. in a solution of the potassium salts of 3 IAA (Hernandez et al 1944-1945)

Denny and others (1942 - 1943) were able to inhibit sprouting by storing potatoes with paper strips that had been saturated with the methyl ester of alpha-naphthalene acetic acid (MENA) one hundred mgm. of the chemical per one kg.

Stuivenberg & Veldsera (1942) tested a spray treatment with 2 % solution of MENA in 95 percent alcohol. The solution was applied in an amount to supply 0.35 gm. of MENA per bushel of potatoes, which were covered immediatly after treatment to prevent loss of ouxin by evaporation. The treated potatoes and control samples were stored in clamps. This treatment also was highly effective, although it resulted in a higher percentage of decayed tubers than that in the untreated controls. This was attributed to the moist condition caused by spraying. Thus they recommended the application of these chemicals in the form of dust.

Thomas and Piker (1944) found that treating potato tubers with MENA at the rate of 0.9 gm. per bushel as a sprayed, dust or impergnated in shredded paper was effective in same varieties of potato when kept for 2 - 4 months at 70° F. The treated tubers lost some water but were still

marketable at the end of storage period, whereas the controls were worthless. The same authors (1946) also observed complete inhibition of sprouting for 70 days at 70°F by application of 0.4 percent. MENA. Danis and Campbell (1946) found that when they treated Katohdin potato variety shortly after harvest with a dust application of 2/3 - 11/3 grams of MENA per bushel, complete sprout inhibition for 4 months at 27 - 70°F. was obtained. Treated potatoes germinated poorly, even at 2 months after planting, and sprouts were abnormal, Stuivenberg et al. (1947) found that when acetate of MENA was used in cellars of cold - storage warehouse on potato varieties (Eigenheimes and Bintje) and in a pit on a farmyard on the variety Bevelan- des. Winter spraying with 1.4 and 0.5 gram of ester of MENA per 70 kg. of potatoes slightly inhibited sprouting when checked in March. Spraying in March with 1 gram per 70 kg. of potatoes had a storage inhibiting effect. To pervent sprouting by early spraying in October, 8 gram per 70 kg. should be used. Under pit storage conditions, spraying with 1 gram per 70 kg. was successful. When decay is expected, dusting is recommended. Treated potatoes cooked well and maintained their quality, and so as far as has been investigated. Neither Vitamin C content was not