THE EFFECT OF LOW TEMPERATURE AND ARTIFICIAL RIPENING ON QUALITY AND STORAGEABILITY OF PEARS

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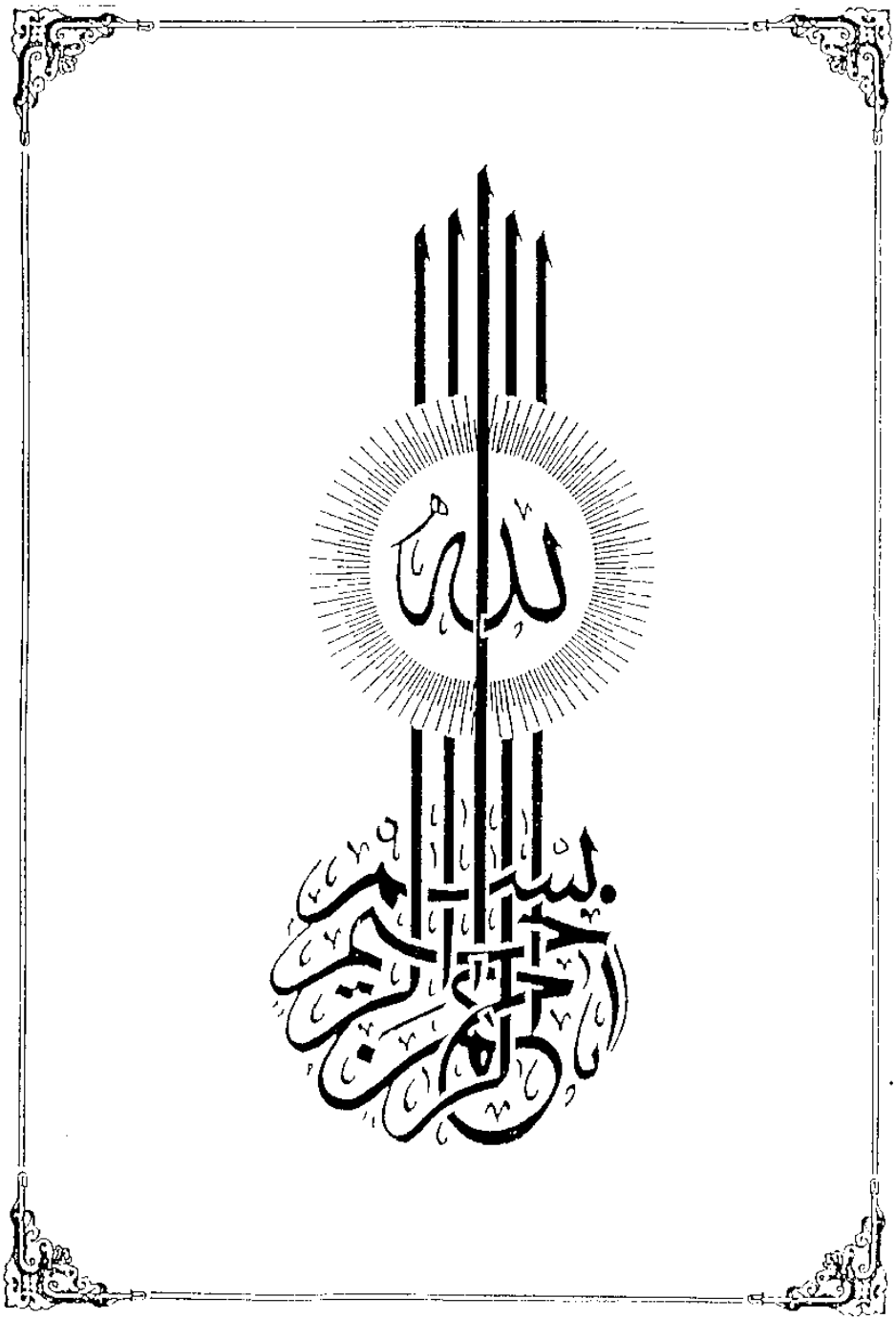

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CONTENTS

INTRODUCTION

Pears belong to the order Rosales (roses) and the family Malaceae which includes the apple and quince. It is of the genus Pyrus which includes 20 to 25 species of pears native to Europe, Asia and northern Africa.

Pears do not come true to variety from seed, the most are propagated by budding or grafting onto selected root stocks such as the European wild pears. (Fruit and vegetable facts and pointers 1962).

The common cultivated pear varieties were introduced to Egypt some fifty years ago. The most important of these are Le Conte and Kieffer varieties. While Le Conte is widely distributed all over the country, Kieffer variety is rather limited inspite of the fact that its friut is large, attractive and rather resistant to many fungi and insects that usually attack other pomoceous fruits. Its limitation is mainly due to the claimed view that Kieffer fruits never attain ripening condition if left on the tree, moreover its quality is rather poor.

Wali (1958) attributed the poor quality of Kieffer pear to the erronious ripening technique. He

added that this variety is expected to be of major importance providing it is properly ripened, since it is more successful in this country because of its lower chilling requirements than Le Conte variety.

Le Conte variety of pears considered by Lee (1948) to be hybrid between pyrus communis and pyrus pyrifolia.

Calleryana pear seedlings (Pyrus calleryana Deene) have been commonly used as a stock since 1925 (Ghannam 1928). At a later date, calleryana was propagated by the stem and root cuttings (El-Azzouni 1952).

Le Conte trees on calleryana grow rather vigorously, but they are highly susceptible to canker infection and chlorosis.

The common French pear (Pyrus communis, L.) (Bailey 1947) is now recommended as a stock. Crown and root galls, in addition to fire blight, affect these stocks causing considerable losses.

The "Le Conte" variety is more successful in Egypt than the European types because of its lower

chilling requirements (Wali 1956).

"Le Conte" tree is medium in size vigorous, slow growing, very productive, and a regular bearer.

The mature fruit of "Le Conte" pear is large oval in shape and tapering at both ends. The skin is usually thick, tough and smooth, but it is sometimes rough and dull, its colour is pale, yellow and occasionally marked with rust. The fruit is poor in quality, its flesh is firm, white in colour, rather granual and contains quite a few stone cells. The fruit is juicey and sweet.

The pears production area in Egypt exceeds 4107* feddans grown in Egypt in 1970.

More than 60 % of this area is located at Behaira Province because of its favourable climate and soil conditions.

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* Statistics and Agricultural Economic Department, Ministry of Agriculture, U.A.R., 1970.

Fruit ripening is a physiological process during which certain chemical changes take place, due to enzymic activities. This leads to the softening of the fruit which is accompanied by the development of the characteristic colour and odour of the ripe fruit.

Temperature and treatment with special chemicals, in the physiological range, seems to influence the rate of ripening as it does affect other physiological processes. The rate of ripening, in its turn, would propably affect fruit quality.

The aim of this research is to study the effect of low temperature (32°F.) and artificial ripening such as treatment with Ethrel (2-Chloro ethane phosphonic acid or CEPA) at different concentrations and intervals, on quality and storageability of "Le Conte" pears. The study includes the physical and chemical changes occuring at these intervals.

REVIEW OF LITERATURE

I. The maturity index of pears:

Overhalser, et al (1944) found that pear fruits maturity could be assigned through size, skin colour chart, the increase in sugar content, the amount of soluble solids, the odorous constituents and the less in firmness of the tissue. They mentioned that the number of days from bloom, used in connection with firmness of flesh, and ground colour, is another helpful index in determining maturity.

Haller (1952) reported that a decrease in fruit firmness occured during maturity and ripening. He found also that the best eating quality of pears in reached around a firmness of 3 - 4 lbs. He also referred to the significance of the pressure test and its importance in establishing picking maturity standards. Kieffer pears attained optimum maturity at 13.5 lbs.

El-Azzouni and Wali (1956) found that "Le Conte" pear fruits were reached to maturity when the firmness was ranged between 11 to 12.5 lbs and the T.S.S. was ranged between 9 - 11 %.

II. The effect of storage temperatures on fruits ripening:

Many investigators studied the effect of storage temperatures on keeping quality and ripening of pear fruits. They found that the optimum degree for storage was ranged between 30 to 32°F and relative humidity 80 to 90 %.

Moore (1933) reported that Anjou Buerre Bosc, Comice and Winter Nelis pears could be brought to optimum eating quality in a warm room, following storage at 30°F. there were no significant vareietal differences in most of their constituents.

Moon and Culpepper (1934) mentioned that Kieffer fruits developed superior quality when stored at 60 - 65°F, rather than at higher or lower temperature. Moreover, they found that the fruits kept at 60°F. for 16 days were better than those stored for shorter periods at this temperature.

Overhalser et al (1944) found that the optimum degree for pear fruits storage was 30 to 31°F, then fruits were ripened at 60 to 70°F and a relative humidity of 80 to 85 %. They mentioned also that ripening tempera-

tures higher than 70°F. are not desirable and may result in poorly flavoured tough textured pears, or in losses from decay prior to softening.

Culpepper, et al (1946) reported that kieffer pear fruits may be started for a period up to 70 days at 32°F. before ripening at 60 - 65°F.

Padfield (1955) found that the hard green fruits of Newzealand grown Williams Bon Chreten pears, when removed from storage after fifty days, ripened satisfactory after seven days at 50° to 55°F. Fruits held for a similar period at 40° to 46°F did not ripen and become over ripe when kept at 60° - 65°F. He added that the percentage of sound fruits remaining after storage decreased with increased delay between harvest and cold storage.

Sugiyama and others (1965) reported that pear fruits picked on different dates between late August and mid-September were after-ripened at temperatures of 15°, 20° and above 25°C. (room temperature), either immediately or after cold storage at 4°C. for 1 - 2 weeks. Fruits held at room temperature ripened later and less uniformly than those at 20°C and suffered a great percen-

tage loss due to rots. Fruits after ripened at 20°C were superior in both flavour and quality to those ripened at room temperature. Cold storage before after-ripening improved the appearance and flavour of fruits at all the temperatures, and greatly reduced the development of rots. Some internal breakdown was observed in fruits which were picked late and cold stored for 2 weeks.

III. Artificial ripening :

Allen (1930) found that winter pears exposed to ethylene gas (1 : 100) for 4 - 10 days, were usually intensely yellow and softer after a given period. The ethylene treatment, however, failed to influence the sugar or acid content of the pears. Kieffer pears when treated with ethylene, showed a progress in colouring and some slight effect on softening and rate of ripening.

Hansen (1939) investigated the effect of ehtylene on pectic changes in ripening walnuts, pears, peaches and prunus. He found that ethylene treatment has a very pronounced effect upon pectic changes. Soluble pectin increased and insoluble protopactin decreased.