EFFECT OF FIELD SPRAY OF SOME GROWTH REGULATING SUBSTANCES ON ONION

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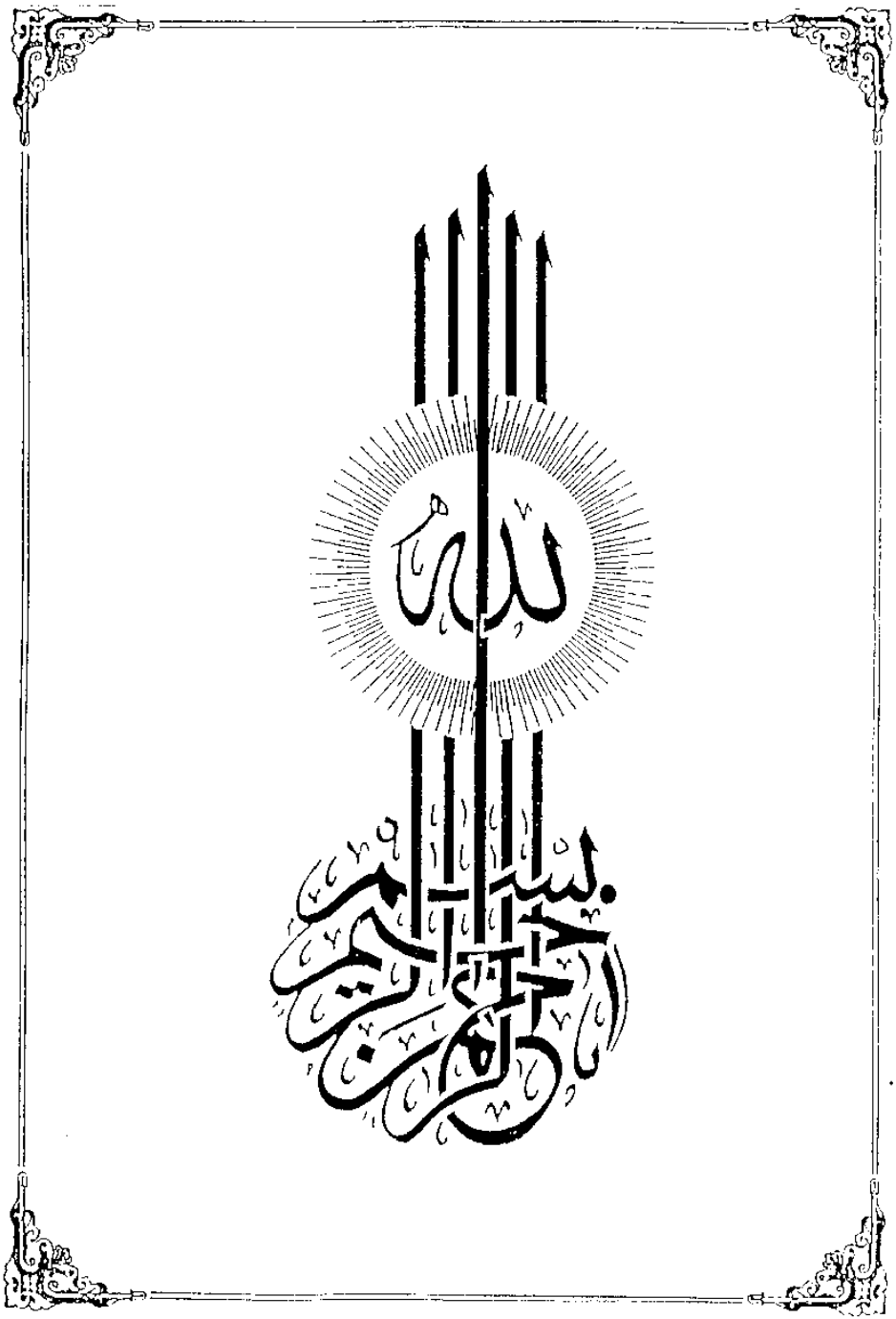

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C O N T E N T S

INTRODUCTION

In Egypt, onion (*Allium cepa* L.) can be considered as one of the most important economic crops. Its economic importance comes from the fact that large quantities of this crop are exported yearly. It constitutes the third most valuable export crop. Egypt ranks the fourth country in the world in onion production, while it stands the first in onion export(Jones and Mann (1963).

Onion is grown in Egypt as an early summer crop in the Delta region (Lower Egypt) where it is usually interplanted with cotton, and as a winter crop in "Middle and Upper Egypt".

Onion is stored in Egypt for sometime in the year, whether it is grown as an early summer or as a winter crop. Bulbs may be stored during the summer under rather relatively high temperature. In Egypt, where summer storage is necessary, cold storage is not easily available, and even if it is so, it would be too cost. Under all storage conditions, onion bulbs lose continuously water and dry matter, but the serious loss arises from sprouting. Extensive growth of sprouts results in a rapid loss of weight accompanied by wilting and a considerable decrease in the food contents. In extreme cases, the onion bulbs become unmarketable, and constitute great trouble to the producer.

Usually onion bulbs, after a period of active growth, enter a dormant stage, even under favourable conditions for growth.

Breaking the dormancy usually takes place only after the completion of the dormant period, unless dormancy is prolonged by exposure to artificial dormancy treatments.

Much empirical work has been done since the beginning of the present century in attempts to find suitable chemical substances for prolonging the dormancy of subterranean crops during storage. The substances which proved most successful are two compounds: "Maleic hydrazide (MH)", and "O-iso-propyl-N-phenyl carbamate (IPC)" and their drivatives (Audus,1963; and Jones and Mann,1963). However, very little is known about the artificial dormancy treatments and the mechanism of action of sprout inhibiting substances. Therefore, it was suggested that careful investigation might be carried out in an attempt to add more information on the response of onion plants to pre-harvest foliar sprays with some growth regulating substances and to elucidate their mechanism of action.

In trying to approach this aim, a series of studies were carried out during successive seasons extending from 1965 to 1970 which include:

1) Studies on the effect of pre-harvest foliar sprays with some growth regulating substances on the quality of bulbs at cropping and during storage in trying to improve the keeping quality of onion bulbs during storage.

2) Comparative studies of their effects on nitrogen, phosphorus

potassium, available sugars, volatile sulphur, and natural hormone contents in the various parts of bulbs during storage in an attempt to elucidate their mechanism of action on sprout behaviour.

REVIEW OF LITERATURE

Growth regulators are organic compounds which may participate in the control of plant growth, and which in small amounts promote, inhibit or otherwise modify any physiological process. Among the different types of growth regulating substances there are some compounds which are able to inhibit growth and some physiological processes. These compounds are usually named growth inhibitors. Within this type of substances there are some compounds which inhibit sprout growth in storage, not only with carrots, potatoes, sugar beets, and sweet potatoes, but with onion as well.

Growth inhibiting substances have been successfully used by agriculturists to bring about specific effects which are economically important such as , weed killers,(Crafts,1963; Bakr Ahmed and Zahran,1958; Woodford et al. 1958, and Zahran,1963), regulating abscission (Zahran,1963); and control of sprouting in onion and potatoes (Wittwer et al. 1950; Dhesi et al.,1966; Garas,1970; and Kato,1971). They have also been used for holding back growth of hedges, lawns, and for inhibiting secondary growth on cotton, beans, alfalfa and similar crops where late vegetation interferes with harvest

(Crafts,1953; Woodford et al.,1958).

The physiological responses of plants to the application of growth regulators were found to vary according to many factors, such as the chemical nature of the growth regulator, its concentration, method of application, the species and varieties of plants, the age of the plant at the time of application, the environmental conditions at the time of application and growth conditions prior to, and after treatment. All the above are few factors which play a part in determining the results measured by investigators(Ibrahim, 1970).

1- Effects of some growth inhibitors on yield and its quality.

From the current literature dealing with the effect of growth regulators and especially growth inhibitors on plant yield, it was concluded that certain growth regulators can alter the distribution of dry matter within the plant, so as to increase the economic yield and also enable the plant to adapt to adverse conditions,(Garas, 1970).

As the effect of MH on the yield and its quality, Simons and Scott (1952) showed that pre-harvest foliar spray with such substance on sweet potato had no effect on dry matter or sugar content. Paterson and Wittwer (1953) used different concentrations of (MH_{40}) applied to the foliage of onion at different times before harvest, and they concluded that yield or marketable onion at harvest were not significantly influenced by any of

such treatments. Rakitin and Svarinskaya (1959), reported that treatment with MH does not have any undesirable effect on the size or quality of potato yield. Frode (1961) concluded that spraying potatoes with MH during the flowering period or later influences slightly the yield , while it does not influence the content of dry matter and the size of the tubers. Garas (1970) showed that pre-harvest foliar spray with MH did not exert any significant changes in tuber size and resulted in non-significant effect on the yield of potato tubers.

On the other hand, Denisen (1953) reported that yield of potatoes was greatly reduced with increasing the concentration of (MH_{40}) when applied at pre-bloom and full bloom stages. Cibes et al., (1955) showed that spraying potato plants six weeks before harvest with MH at 5% level gave the poorest yield and small deformed tubers.

However, Mikkelson et al. (1952) showed that sugar beets treated with foliar sprays of MH had increased sucrose content, sugar yield and fresh weight yield per acre. Towfic (1960) reported that treatments with MH increased the weight of onion bulbs. Hirano (1967) concluded that 5000 p.p.m. (MH_{40}) applied as pre-harvest foliar spray, produced an insignificant higher yield than the control or other lower concentrations of MH.

With regard to the effect of carbamate compounds on the

quality of the yield, most of the previous investigations were directed towards the effect of post harvest application of such compounds. Downie (1952) and Edwards (1952) who used IPC as post harvest application to potatoes, found no undesirable effect on appearance and cooking quality with such treatment.

Omar (1965) reported that sweet potatoes treated with 1% CIPC or 1% MH applied as pre-harvest foliar sprays, had no effect upon the dry matter content of roots at harvest.

William (1953) found in his study of the effect of chloro IPC on grass control in onion that yield of onion from the treated plants with such substance, were neither adversely affected nor enhanced. Bakr Ahmed and Zahran (1958), using CIPC in pot and field trials to control "Broomrape" in horse bean plants, found that the use of CIPC just before anthesis has a clear influence upon the production of horse bean plants. Zahran (1963) stated in his study of control of "Orobanche" in horse bean plants that post emergence treatment with CIPC increased the yield of horse bean significantly. He also concluded that the use of CIPC at the rate of 8 lb/feddan as post-emergence was superior in this respect than all other treatments.

2. Effect of some growth regulator substances on the keeping quality of bulbs during storage.

i) Loss of fresh and dry weights :

Among the prime factors that determine the keeping quality of onion bulbs during storage are dry matter, and moisture contents. In stored onion, as in all living tissues, respiration results in the continual loss of stored food (dry matter) and in the production of heat. Although the respiration-rate of onion bulbs is much lower than that of most vegetable crops, the loss of dry matter is considered important because bulbs are often stored for longer periods. This loss may be especially important in onion that are held for dehydration, and dry matter is the end product, (Jones and Mann,1963). The latter authors also concluded that under all storage conditions, onion bulbs continually lose water beside losses in dry matter, but the more serious losses arose from sprouting and rooting. Rates of dry matter loss could be estimated from data on respiration as shown by Thornton (1933), Appleman and Smith (1936), and Wright and Whiteman (1954). Dry weight losses vary from 0.1 to 0.9 lb per ton of bulbs per 24 hours in South Port White Globe onions stored at 0°C, and Yellow Bermuda stored at 25°C, respectively. These figures did not include weight-loss from other causes, such as transpiration, rots, or sprouting.