EFFECT OF IRRIGATION AND SPACING TREATMENTS ON THE GROWTH AND YIELD OF MAJORANA HORTENSIS, MNCH.

By

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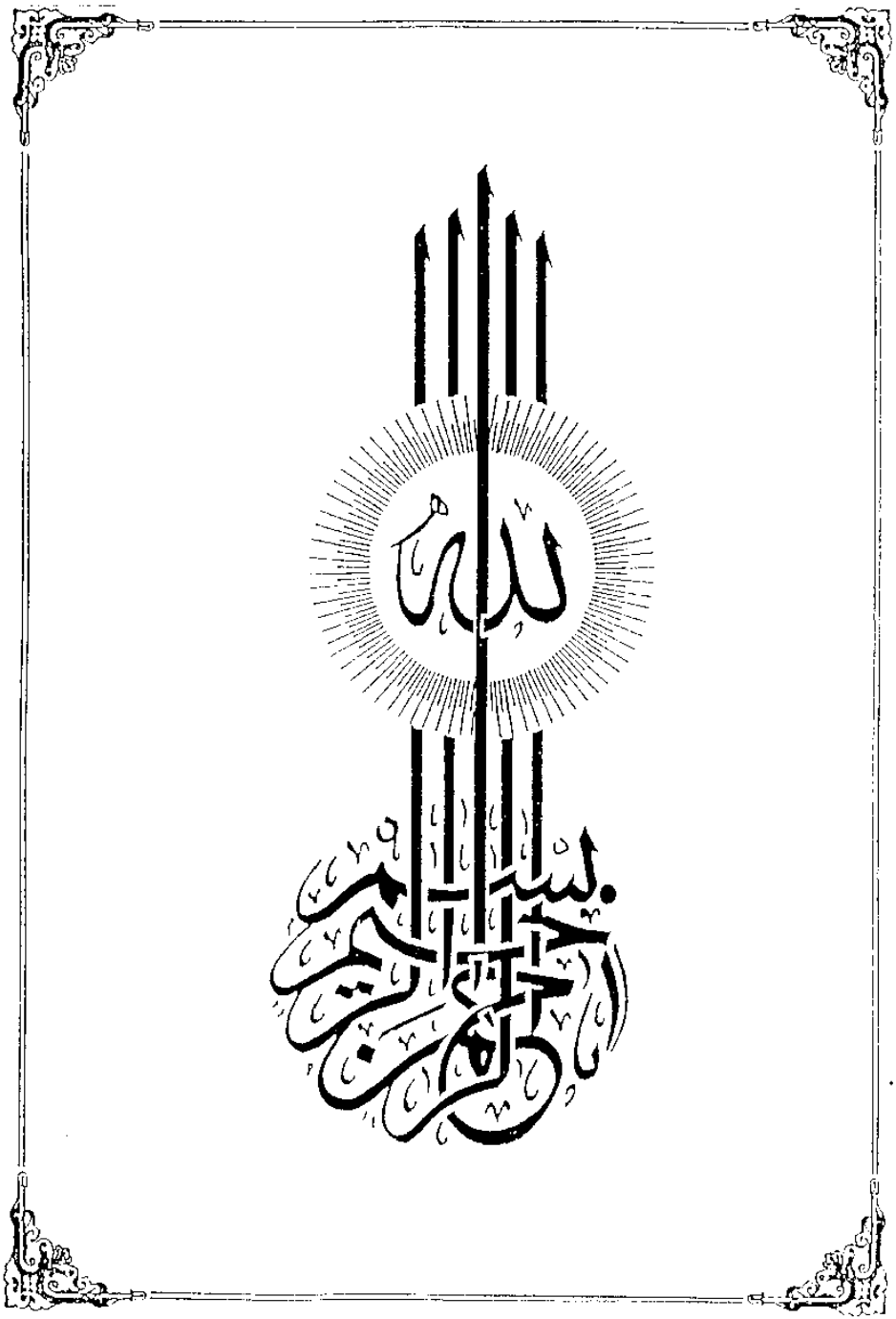

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INTRODUCTION

The local planting of the medical and aromatic plants started only fourty years ago, and up till now the cultivated areas are relatively small. Nowadays, there is a growing interest for expanding the planted areas; especially with those crops showing industrial and economical profits.

Sweet marjoram (Majorana hortensis, Mnch.) represents one of these crops that has been known in both local and forigen markets. It is grown in A.R.E. as a perennial plant for its strong, highly aromatic, spicy pleasing odor and flavor. The dry leaves are widely used as a condiment for soups and in many other food industries. It is also used in pharmaceutical preparations as stimulating and antiseptic of inflammatory conditions, tooth pastes, whooping cough and larynx affections and in many other purposes.

There are not enough information concerning the cultural requirements of sweet marjoram under the local conditions. The irrigation intervals as well as the distance

between plants are among the most important factors that affect the yield. Therefore, any work with the aim of improving these practicles and obtaining the highest yield possible would be of great importance.

REVIEW OF LITERATURE

The information dealing with the effect of the irrigation intervals and the distance between plants on the growth, oil content and chemical composition of marjoram plants are quite scarce in the literature.

I - Effect of irrigation on growth, oil content and Chemical Composition

The growth :

El Shamy (1968), revealed that daily irrigation of pyrethrum plants grown in pots, was more favourable for increasing the number of flowers per plant, the weight of 100 fresh flowers as well as the pyrethrin content, than plants irrigated at 3 or 6 days intervals. However, the percentage of pyrethrin was the highest in the flowers obtained from plants irrigated daily or at 6-day intervals. The nature of pyrethrins and other constituents of the flowers was not affected by such treatments.

El Hossary (1970), found that the dry weight of the different organs of Saponaria officinalis increased with 7-day irrigation intervals than other treatments as 14 and 21-day intervals.

Massey et al. (1962), demonstrated that higher [illegible] of broccoli was produced on the high moisture plots than low moisture plots. The organoleptic and chemical composition studies indicated that irrigation increased the succulency and decreased the per cent of dry matter of broccoli plant parts.

Berenyi (1968), found that irrigation treatments of pepper did not result in great differences. However, irrigation reduced the yield of the first picking, but increased that of the second and subsequent pickings. The pigment of pepper contents was reduced by irrigation but was compensated by an increased weight of the dry fruit wall.

Zadi (1950), working with tea in subtropical region found that irrigation increased the length and width of leaves of all three flushes.

The oil content :

Tabak Forsschungsinsi (1953), mentioned that water deficiency decreased the marjoram leaf size and gland counts but resulted in a slight increase in the gland density. Schroeder (1963), reported that the essential oil content of marjoram was high at medium soil moisture level. The

root yield expressed as percentage of total material was inversely proportional to the soil moisture content. The transpiration quotient rose with an increase in water supply. There was no evidence to support the view that essential oils act as transpiration check. The number of marjoram leaves as well as the leaf size was largest under condition which gave the highest yield of plant material. There was a significant negative correlation between leaf size and oil gland density but neither character showed a clear relationship with essential oil content. The node number and internode length were positively, though not significantly, correlated with essential oil content. The variance in volatile oil content was due to different degrees of filling of oil glands.

Cutting (1961), mentioned that irrigation and also nitrogen and phosphorus fertilization might increase the yield and oil content of geranium but the oil quality was reduced. Agena (1966), working with Pelargonium graveolens, pointed out that the fresh weight of the plants and oil yield increased as the irrigation intervals were shorter than the two other treatments as 16 and 24-day intervals.

Hopper et al. (1956), mentioned that when the weather was dry and warm, the yield of peppermint increased even with the highest level of irrigation. The moisture should be determined, so that the saturation of the soil is an average 65 - 80% of moisture capacity. Irrigation should not be applied 1 to 2 weeks before harvesting since this would hinder harvesting.

Hotin (1969), found that the essential oil content in mint leaves increased as the temperature increased to 23 - 25°C. The soil moisture deficiency caused a decrease in the essential oil content of coriander fruits, mint and basil leaves but a surplus of moisture caused a reduction in sage and lavender inflorescences. On the other hand, shading increased the essential oil content of coriander fruits, mint and basil leaves and reduced it in sage and lavender inflorescences.

El-Mansi et al. (1970), mentioned that the 14-day intervals proved suitable in irrigation treatments to obtain high fruit yield of coriander. On the other hand, the 21-day periods increased the oil percentage in comparison with 7 and 14-day treatments.

[illegible] composition :

Kandil and El-Darwy (1957), showed that the percentage of total nitrogen of sunflower was not significantly influenced by fertilizer treatments and water levels. The nitrogen content of the hundered air dried seeds was significantly influenced by water levels of irrigation at 5% level.

Tombsi and Cale (1958), mentioned that water deficiency increased respiration and polyphenol oxidase activity and decreased catalase and carbohydrase activities in Vicia faba plant. Lack of water, reduced N and P but increased K percentage in the leaves, while the combined content of these elements was depressed. It also increased the carbohydrate level in the plant.

Nadzhafor (1966), working with leaves of mulberry found that in May, the amount of monosaccharides was lower than the starch. In June and July, the order was reversed. In September, starch started to increase again. A variation in the amount of P was in accordance with that of carbohydrate. In general, watering improved the synthesis of organic substances.

Effect of spacing on growth, oil content and chemical composition

The growth :

Dafert and Mauerer (1923), found that the yield of Saliva officinalis plants in the first crop decreased with increasing the spacing intervals from 25 to 30, 40 and 45 cm. This reduction might be due to the decrease of shading effect upon the young vegetation. In the second crop, while the plant yield was greater with the wider spacing, the yield per unit of area was less.

Agena (1966), pointed out that germanium plants spaced at wider distances were heavier than those spaced at closer distances. The total fresh weight of the plants from the plot in which plants were spaced at closer distances was larger than others from plots with wider spacings, by about 32.08% and 42% for the two year experiments respectively.

El-Gamal (1969), found that datura plants spaced at 60 and 75 cm produced the heaviest fresh weight and the greatest number of leaves per plant. On the other hand, plants grown at narrowest spacing gave a higher hero and leaves yields per plot. Spacing did not affect the alkaloid concentration in leaves or stems.

[illegible] reported that the highest plant [illegible] pyrethrum flowers and pyrethrin were obtained at a distance of 70 x 30 cm , followed by 60 x 20 cm.

The Oil Content :

Dos Santos and De Oliveira (1961), compared different spacing intervals ranging from 20 x 40 cm to 100 x 40 cm. for mint in poor agriculture soils. They found that the highest yield of mint and essential oil were obtained with the spacings of 40 x 20 , 50 x 20 , 60 x 20 and 50 x 40 cm. The last one was the most practical and economical spacing.

Milcev et al. (1963), reported that lavender plants gave the highest yields of both flowers and essential oils when spaced at 40 cm. apart in comparison with those of 10 and 20 cm. spacings.

Dutta and Singh (1964), working with Matricaria Chamomilla found that the highest yields of fresh flowers and oil content per/ha , were obtained from the moderate spacing at 30 cm. whereas, the highest yields per plant in weight and number of fresh flowers were obtained at 45 cm.