EFFECT OF SOME AGRICULTURAL PRACTICES ON GROWTH AND YIELD OF RAPE PLANTS

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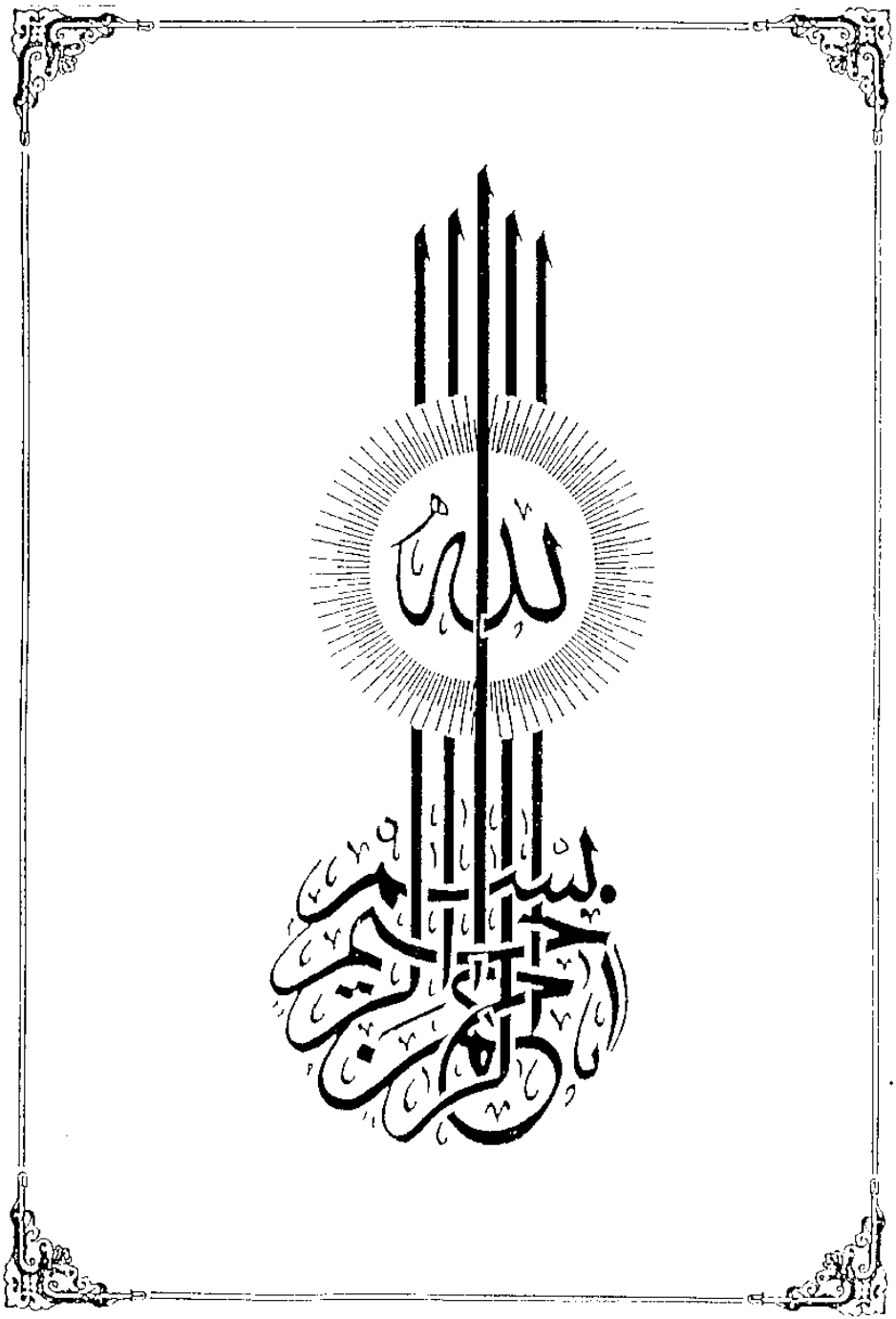

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C O N T E N T S

INTRODUCTION

The agricultural sector in Egypt suffers from many pro-problems, among them two factors play a very important role in an Egyptian's life. The first one is lack of production whereas the second one is the continuous reduction of water in Naser's lake since 1979 up till now.

Consequently, vegetable oil has not kept pace with the population and the gap between production and consumption expands continuously and consistently from one year to another. The total consumption of vegetable oil rose to 429083 and 756149 tons per year in 1984/1985 and 1985/1986, respectively (Chamber of Food Industries)*. The production represents 67% and 39%, respectively indicating that the reliability of Egypt on vegetable oil imports increases continually. In addition it is expected that the consumption of vegetable oil will increase about 6 % by the year which in turn will complicate problem. The studies over the last decade in Egypt concluded that it is immposible to rely on cotton and corn to provide the population with their future requirements of vegetable oil since it is difficult to increase their cultivated area throughout the old valley. In addition, they don't thrive well out of the old valley i.e. under reclaimed soils which suffer from water deficiency. Cultivation new

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* Chamber of Food Industries 1985/86.

non-traditional oil crops such as canola (rapeseed) in the soils located out of the old valley seems to be one of the most promising solutions. This crop provides farmers with a high percentage of oil (40-50%) as well as cheap fodder with top quality protein (20%). In addition it prevents erosion in newly reclaimed soils.

The former solution will lead us to try to face the second problem i.e. the continuous reduction of River Nile output. In the short term, it is very urgent for agronomists to ration the water output by different means. Cultivation of small water duty crops which could be grown under water deficiency without great damage on the growth and yield or in another way which tolerates water stress seems to be one of the suitable solutions.

For that reason, this study was performed to determine some of agronomic practices i.e. irrigation and nitrogen fertilization such as mineral or/and bio fertilizers that contribute to increasing growth and yield of rapeseed plants.

Biofertilizers i.e. root bacteria association (cryptic) may have profound effects on plant growth. Such a system may involve several bacterial species such as Azotobacter and Azospirillum that could contribute to the supply of soil nitrogen under reclaimed soils.

REVIEW OF LITERATURE

Effect of irrigation :

1. On the growth :

Different experiments were carried out to asses the response of rape growth to irrigation and drought.

Nathawat et al. (1969) studied the relationship between some growth creteria and drought conditions. there was a positive correlation between primary branches and number of pods/plant of Brassica campestris variety "Sarson Prain". The number of pods/plant significantly increased yields.

Providing turnip rape (Brassica campestris) with water by growing under four levels of irrigation produced more than doubled yield throught producing greater plant growth, more pods, more seeds per pod and larger seeds than without irrigation (Krogman and Hobbs, 1975).

Irrigation increased pods number per plant (Clarke, 1978).

Under 3 water regimes, the leaf area index, number of branches per plant, number of pods per plant, number of seeds per pod, pod surface area and crop growth rate of rape (Brassica napus) cultivar "Tower" increased by irrigation as reported by Clarke and Simpson (1978).

Joarder et al. (1979) showed that irrigation mustard (Brassica juncea) cultivars "Rai 7", "Laha 101" and "Rai 5" increased the number of primary and secondary branches, pods and seeds/plant.

2. On the yield :

The yield is the out put of plant genetical make up and the environmental conditions among which soil moisture content is one of the most important factor so that Nathawat et al. (1969) reported that, under drought conditions the number of pods per plant increased significantly which in turn increased yields of Brassica campestris variety "Sarson Prain".

Mathur and Tomar (1972) noticed that the time as well as the number of irrigation influenced the yield of raya. Two irrigations applied at the preflowering (40 to 45 days) and at the post flowering (80 to 85 days) of raya (Brassica juncea) were recommended. The irrigation requirement of raya was 32 cm, which could be splitted at pre-and post sowing applications.

Nuttall (1973) indicated that low (100 mbars) soil moisture tension gave higher yields of "Target rape" (Brassica napus) than high (151 mbars) moisture tension.

Maintaining soil moisture in the upper half of avail-

able range until pod ripening produced maximum yield of Brassica campestris cultivar "Span" as concluded by Krogman and Hobbs (1975).

Bhan and Dhama (1977) studied the effect of 1, 2 or 3 irrigations by scheduling either to critical growth stages or to climacic needs on Indian mustard (Brassica juncea) cultivar "Varuna" and "K I". They indicated that increasing the number of irrigation increased seed yield of cultivar "K I" whereas, cultivar "Varuna" had no further yield response with increasing the number of irrigations from 2 to 3. 1 or 2 irrigations were applied to climatic needs proved more effectiveness on seed yield of studied varieties.

Also, Clarke and Simpson (1978) found that under three irrigation regimes, the 1000 seed weight of rape cultivar "Tower" were increased. They added that yield was correlated with 1000 seed weight.

Rape yields were increased nearly four fold by treating plants with combination of irrigation and nitrogen fertilizer (Henry and MacDonald, 1978).

Joarder et al. (1979) reported that irrigation of mustard cultivars "Rai 7", "Laha 101" and "Rai 5" increased yield/plant and yield/ha by 65 and 59% compared to the rainfed treatments, respectively.

The highest seed yield of raya (Brassica juncea) was obtained by adding water five times throughout the life of plants (Atar, 1979).

Seed yield of 2 mustard cultivars were affected significantly by the soil moisture content. It reached its maximum by irrigation after depletion 60 or 75% of available soil moisture content in the 25 cm top soil layer than depletion 90% of available soil moisture or without irrigation (Bhan, 1979). He added that maximum yield (3.37 t/ha) was obtained by irrigation after 60 - 75% available soil moisture and 120 kg N/ha.

The relationship between seed yield and irrigation levels of brown sarson (Brassica campestris) variety "Dichotoma" was curvilinear, reaching its maximum when 21.8 cm of water was applied and decreasing at higher rates (Singh and Yusuf, 1979).

Munoz and Fernandez (1979) showed that seed yield of rape (Brassica napus) variety "Midas" was significantly higher being 2.61 and 2.69 t/ha with 573 and 495.5 mm of water than 398 and 338 mm which obtained 2.34 and 2.24 t/ha, respectively.

Bhan et al. (1980) reported that maximum yield of rape seed cultivar "T_9" was obtained with 2 irrigations. In

addition, they found that one irrigation at flower initiation gave higher yields than at pod development stage.

Prihar et al. (1981) found that irrigation 3 weeks after sowing gave maximum seed yield and water efficiency of mustard (Brassica juncea). The percentage increase of seed yield over unirrigated treatments was 30 to 40%.

The times of irrigation had a pronounced significant effect on seed yield . Chaniara and Damor (1982) concluded that irrigation at 25 and 15 days at intervals five and seven times were similar, but higher than five times at 35 day intervals.

Singh et al. (1983) showed that 1 or 2 irrigations in dry seasons gave significantly higher seed yield of raya (Brassica juncea) variety "Zern" and "Coss", and (Brassica napus) variety "Gobhia Sarson".

Joarder (1983) concluded that seed yields of three oilseed rape cultivars (Brassica campestris) increased 3 times by irrigation in comparison to unirrigated one.

Stoker and Carter (1984) reported that irrigation with 2 - 3 flood irrigations generally, increased seed yield of rape cultivar "Tower". It was recommended that irrigation should commence at the onset of flowering after which soil

moisture should be maintained above 15% (25% available soil moisture) by means of 2 - 3 flood irrigations or 50 - 70 mm applied by sprinkler irrigation.

Damor and Vegada (1984) stated that the seed and oil yields of Brassica juncea cultivar "Cozern" and "Coss" were higher with 2 irrigations than with 1 irrigation.

3. On chemical content :

Soil moisture content plays an important role in seed oil and protein content.

Nuttall (1973); Henry and Macdonald (1978); Singh and Yusuf (1979) indicated that low soil moisture tension gave generally higher seed oil content and lower protein content of rape seed plants.

Krogman and Hobbs (1975) studied the effect of 4 irrigation regimes on oil content of turnip rape cultivar "Span". They found that providing soil with water through irrigation increased seed oil content and subsequently oil yield from 368 to 986 kg/ha.

On the other hand, Munoz and Fernandez (1979) reported that seed oil content of rape variety "Midas" was not affected significantly by irrigation plants with 573, 495, 398 and 338 mm.

Maximum oil content of rapeseed cultivar T_9 was obtained by irrigation once at flower initiation as observed by Bhan et al. (1980).

Bhati and Rathor (1982) stated that the seed oil content of rainfed mustard (Brassica juncea) was not increased by irrigation once or twice.

Seed oil content of three oil seed rape cultivars (Brassica campestris) were decreased by irrigation three times (Joarder, 1983). Meanwhile, Stoker and Carter (1984) found that applying 2 - 3 flood irrigations generally increased oil content of rape cultivar "Tower".

Effect of nitrogen fertilizer :

1. On the growth :

Nitrogen fertilizer had a pronounced effect on growth of rape plant. It increased number of pods/plant of mustard cultivar "T_{59}" and "KYSR" (Singh et al., 1978); growth of low erucic acid of winter oilseed rape cultivars "Primor" and "Rapora" (Holmes and Bennett, 1979); slightly plant height of winter oil seed rape cultivar "Primor" when it was applied to the seed bed (Harris, 1980), the total dry matter yield/m^2 of spring oil seed rape cultivars "Prota", "Maris Haplona" and "Orpal" when it was increased up to 150 kg/ha (Scarisbrick et al., 1980); the number of pods/plant and pod retention reached their highest values with 100 kg N/ha. They added that the total number of pods/branche and the number of seeds/pod increased significantly by adding nitrogen fertilizer up to 200 kg/ha, whereas, it did not affect the number of reproductive branches/plant as well as the final dry weight.

Hart and Jacobson (1978) showed that fresh weight yields of oil seed rape cultivar "Tower" were increased with nitrogen application up to 40 kg/ha.

Mudholkar and Ahlawat (1981) mentioned that plant height, dry matter and number of pods/plant of Brassica campestris variety yellow sarson (Brassica napus) variety glauca)