SUMMARY

These experiments were carried out during two successive seasons of 1988/1989, and 1989/1990 at the Experimental farm of the Faculty of Agriculture at Moshtohor Zagazig University.

The experimental desigen was in complete randomized block system with three replicates. This work includes two main parts. The first includes three experiments i.e.

Part I : Physiological studies :

- The first experiment aimed to study the effect of two foliage fertilizers namely Foliar X and Forty X in different doses on the growth, flowering and chemical composition of Cuminum cyminum plants.
- The second experiment was to study the effect of water regime and different methods of irrigation on the prementioned characters.
- The third experiment was to study the effect of soil modification treatments on the prementioned characters.

Part II : Pathogenical studies and fungicidal treatments:

- Pathological studies.
- Effect of some fungicides on growth, Flowering and chemical compcaition of cumin plants.

The most important results for these investigations were as follow :-

Part I :-

1- Fertilizing :-

- All foliar X treatments increased height of plant in both seasons whereas with Forty-X treatments plant height increased only in the second season.
- All fertilizer treatments increased the number of branches/plant in both seasons except low and medium level of Forty X in the first season.
- The fresh and dry weight of herb increased significantly with all fertilization treatments compared with unfertilized plants.
- The unfertilized plants produced the lowest value of root length compared with all fertilized ones in both seasons.
- The mean weight of roots increased with all fertilization treatments in both seasons compared with control treatment.
- All fertilization treatments increased the mean diameter of umbels and also the mean number of umbels/plant in both seasons.
- The seed yield/plant increased by all fertilization treatments in both seasons.
- The largest weight of 100 seeds were produced from the medium and high rates (3, 4 sprayings / season) of foliar X and Forty X, respectively, in the second season.

- The fertilization treatments increased oil percentages, and the highest value obtained with the high Foliar X application (4 sprayings).
- The fertilizer applications of Forty X and Foliar X increased nitrogen concentration in plant foliage than unfertilized plants. The increase was proportional with the increase of Foliar X or Forty X fertilizer application.
- Phosphorus and potassium concentrations increased also with all fertilizers treatments.
- Total carbohydrate concentration in plant foliage was also increased due to all fertilizing treatments of both kinds of fertilizers.
- All fertilization treatments increased the amount of cuminaldehyd/plant compared with unfertilizing plants.

2- Irrigation or water stress :

a) Spraying irrigation :

- All irrigation treatments increased mean plant height in both seasons compared with control plants. The low level of irrigation (25 % of F.C.) produced the highest value especially in the first season.
- All levels of irrigation used increased the mean number of branches/plant in both seasons. The largest value obtained by the medium level (50 % of F.C.) compared with other treatments.
- The mean weight of herb increased with all levels of irrigation used than control plants. The highest value obtained with the low level of irrigation followed by medium and high ones.

- Generally all irrigation rates under this experiment increased root length compared with unirrigated plants. The low level produced the largest value for this character.
- The mean weight of roots increased with all rates of irrigation used although the highest weight obtained by medium level.
- The mean diameter of umbels and the mean number of umbels/plant increased with all irrigation levels used compared with control plant. The low level of irrigation produced the highest values of these two character compared with other treatments.
- The seed yield/plant increased with all irrigation treatments compared with un-irrigated plants. The most effective treatment in this respect was low level (25 % F.C) followed by medium level (50 % F.C.) then high level (75 % F.C.) treatment.
- Generally all irrigation treatments increased the average weight of 100 seed than control treatment, the low level of irrigation (25 % of F.C.) produced the best result for this character.
- All irrigation levels increased oil percentage than unirrigated plants. Also the low level of irrigation was more promising in this concern.
- The Nitrogen, phosphorus, potassium and total carbohydrate concentration increased with all irrigation levels than un-irrigated plant. The moderate level of irrigation produced the best results for these characters compared with other treatments.

- The irrigated plants with high or medium amount of water decreased the amount of cuminaldehyde/plant compared with control plant. While irrigation plants with low amount of water gave the same control value for this character.

b) Surface irrigation :

- All surface irrigation treatments increased the mean plant height over control plants for both seasons, plants irrigated at 40-days interval was more taller than both control or those irrigated at 30 and 35 days intervals.
- The irrigation intervals affected clearly the mean number of branches carried by plant. The highest value obtained with the medium interval (35-days).
- The fresh and dry weight of herb increased with all irrigation intervals than control plants (without irrigation) also the mean dry weight of stems increased as the irrigation interval increased.
- The mean of root length, mean fresh and dry weights of roots increased with all irrigation treatments than control plants (without irrigation). The highest value for these characters were obtained with plants irrigated at the 40-days interval over all other treatments.
- The number of umbels/plant increased with all irrigation intervals than control plant. The longer irrigation period (40 days) resulted in the highest value followed by medium period (35-days) and short one (30-days) then control plants.

- The mean diameter of umbels and mean number of umbels/ plant increased with irrigated plants than the un-irrigated ones. The 40 days interval was the most effective in these characters over all other treatments.

  - The yield of cumin seeds/plant increased with irrigated plants than the un-irrigated ones. Also the longest interval was the most superior in this concern than other treatments.
  - The largest weight of 100 seeds produced from plants irrigated at 40-days interval followed by 35, 30 days and control plants.
  - The oil percentage increased with all irrigation periods used, the longer period (40-days) produced the highest percentage in both seasons.
  - The Nitrogen, phosphorus and potassium concentrations increased with all irrigation intervals under study in this work. Also the concentration of these elements tended to increase as the irrigation interval increased.
  - Total carbohydrate content also increased with irrigation treatments than control plants, and the trend of the increase was with the increasing of the interval.

- The short and medium intervals between irrigation plants decreased the amount of cuminaldehyde/plant, while long interval increased the amount of cuminaldehyde/plant compared with control plant.

Soil modification :

- The hight of plant decreased with all soil modification treatments in both seasons compared with control plant except (Lime and Sand + Lime + Sulfur) treatments in the secord season.
- The trend of results was unconstant in both seasons for the main number of branches/plant.
- The fresh weight of herb increased with all soil modification treatments in the first season, while most of the treatments decreased it in the second season except sulfur treatment.
- The soil modification treatments increased the dry weight of herb except with (Sand and Lime + Sulfur) treatments in the first season, while it increased it only with (Sand and Sulfur) treatments in the second season.
- The only soil modification treatments as (Lime, Sulfur, Sand + Sulfur and Sand + Lime + Sulfur). increased the root length than control plant in the first season while all soil modification treatments decreased root length in second season.
- All soil modification treatments decreased the fresh weight of root in the second season, but only (Sand , Sand + Lime and Lime + Sulfur) treatments decreased the fresh weight of root in the first season compared with control plant. Also all soil modification treatments decreased the dry weight of root in the second

season but with opposite effect in the first season all soil modification treatments increased the dry weight of root compared with control plant.

- The soil modification treatments increased the number of umbels/plant in the second season except (Sand) treatment. But only (Lime and Sulfur) treatments increased the number of umbels/plant than control plant in the first season.
- (Sand + Sulfur) treatment increased the diameter of umbel than control plant in both seasons.
- (Sand, Sand + Lime) treatments decreased the average weight of seeds/plant in the first season, but all soil modification treatments decreased the weight of seed/plant in the second season except (Sulfur) treatment compared with control plants.
- The average weight of 100 seeds increased with soil modification treatments except (Sand) treatment in the first season and (Sand + Lime, Lime + Sulfur and Sand + Lime + Sulfur) treatments in the second season.
- All soil modification treatments decreased oil percentage in both seasons except (Sulfur) treatment in the second season and (Sulfur, Sand + Lime and Sand + Sulfur) in the first season.
- Only (Sand + Lime) treatment decreased the nitrogen concentration compared with other treatments.

- The phosphorus concentration increased with all soil modification treatments under this experiment compared with control plant.
- The (Sand + Lime + Sulfur) treatment increased potassium concentration than control plant, but other treatments decreased potassium concentration than control plant.
- All soil modification treatments increased total carbohydrate concentration than control treatment.
- Only (Sulfur, Sand + Lime, Sand + Sulfur and Sand + Lime+ Sulfur) treatments increased the amount of cuminaldehyde compared with control treatment.

Part 2 :

- In the pathogenic tests, each of Fusarium oxysporum and Fusarium solani attained the low values for the percentage of healthy survival plants compared with other fungus, in both seasons.
- With Fusarium oxysporum, all fungicides concentrations increased the percentage of healthy survival plants compared with control plant except low level of Benlate-50 in the second season.
- With Fusarium solani all fungicides concentrations increased the percentage of healthy survival plants compared with control plant except high level of Benlate-50 in the first season.
- Under field conditions all fungicides treatments increased the percentage of healthy survival plants compared with control treatment.
- Mean plant height and mean number of branches carried by plant were improved by using different fungicides substances than untreated plants.
- The mean fresh and dry weights of herb also increased by using fungicides substances especially with Rovral, Bavistin, Benlate and Homai-80 .
- The mean length of roots, and mean fresh and dry weight of roots increased as a result of using fungicides substances in both seasons of the experiments.

- The number of umbels/plant increased owing to using fungicides substances. The most effective treatment in this respect was that of Bavistin.
- The mean diameter of umbels improved by fungicides substances used than control plants, especially with Homai-80.
- All fungicides treatments produced seed yield/plant moreover untreated plants. Homai-80 treated plants produced the highest seed yield/plant over all other substances.
- Fungicides treatments increased the average weight of 100 seeds than untreated plants, the most effective substance in this concern was Bavistin.
- The mean oil percentage increased also according to using fungicides substances. The highest oil percentages were obtained with Homai-80 treated plant in the first season and other treated with Benlate in the second season.
- Minerals content of N, P and K in plant herb was increased as a result of using fungicides substances than control plant.
- All fungicides substances increased total carbohydrate content over control plants except with Rhizolex treated plants.

Recommenditions:

From the obtaining results of these investigations it could recommended for gaining the highest yield of cumin seeds with high content of oil and cuminaldhyed to regard some aspects through the different stages of cumin production :-

1) Since it is known that germination percent of cumin seeds is very low due to Fusarium infection at pre-emergince and postemergence stages, so seeds must be treated with one of the fungicides. The best fungicide used in these experiment was Homai - 80 at 0.4% which resulted in higher number of survival plants and also good yield of seeds and oil per plant.

2) Fertilizing cumin plant with foliar fertilization obtained good results for higher yield of seeds and oil especially when Foliar X was used at concentration of 0.2 % for four times during growth period.

3) During growing period of cumin plant it is preferably to use lesser amount of irrigation water (25 % of F.C.) as Foliar sprays three times throughout the growing season. When surface irrigation used, it is preferably to increase the interval between the irrigation till 40 days with moderate amount of water (100 % of F.C.) which resulted in the highest yield of seeds and oil under this work.

4) Modifing soil of planting by some additives i.e. Sulfur, Lims or Sand also improved growth and yield of cumin plant. The most effective of these additives was Sulfur which resulted in the best results concerning seed yield or oil percent.