CARBOHYDRATE NITROGEN BALANCE IN RELATION TO CROPPING OF THE SHEMLALI OLIVE TREE

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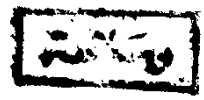

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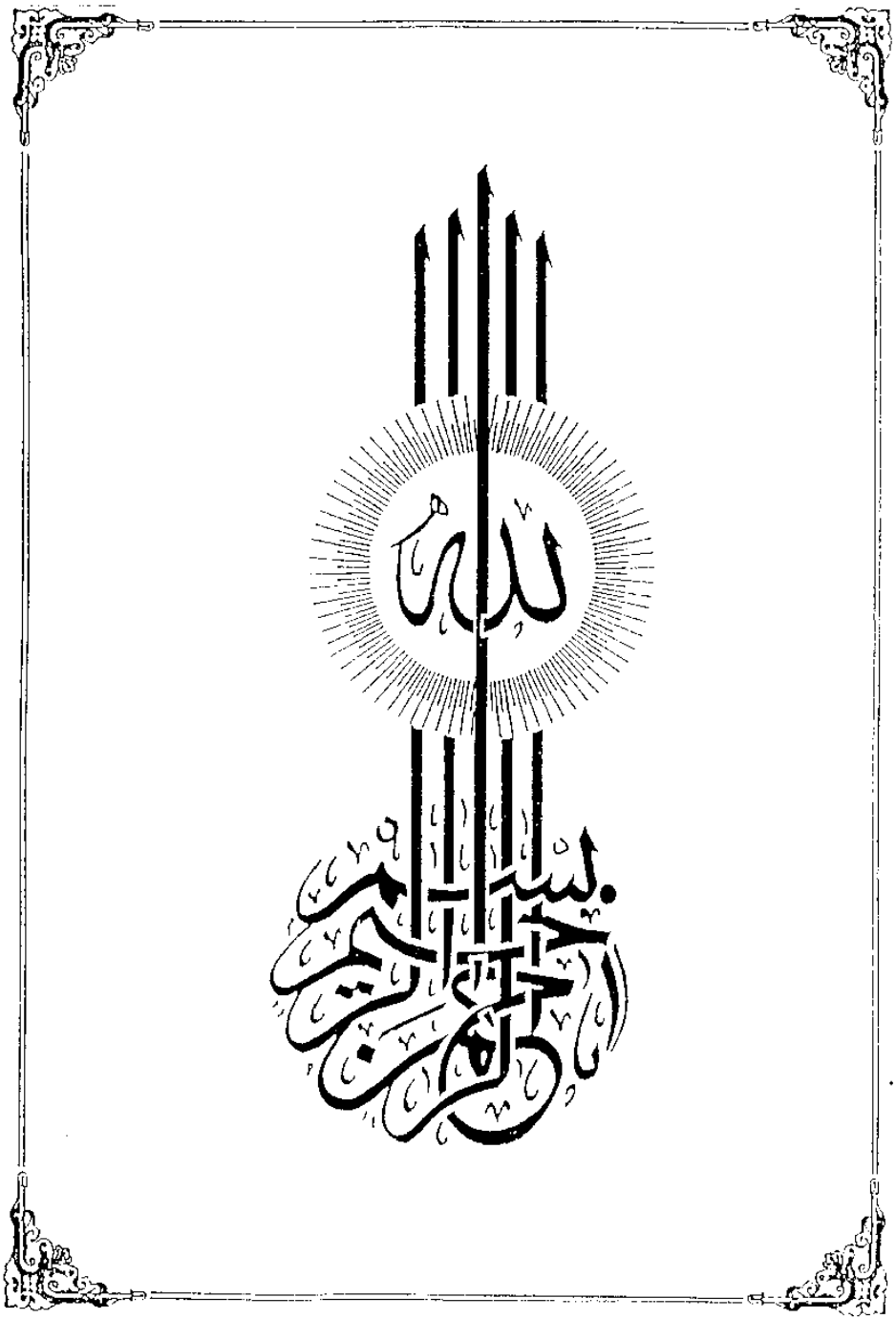

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I N T R O D U C T I O N

The olive tree belongs to Olea europaea L. species, which originated in the hottest countries of Mediterranean Basin where wild olives are found.

Olive tree yields two main products : oil and pickling (or table) olives. The oil is by far the most important source of income, being greatly prized in the entire Mediterranean Basin both for its fine flavour and its cooking properties. Pickled olives come, however, in two types : green and black.

As a matter of fact 99 per cent of the world's olive oil is produced in the Mediterranean Basin. Europe supplies 75-80 per cent of the world's oil. Spain leading with practically one third of the output, followed by Italy with about one fifth, Greece 13 per cent, Portugal 7.5 per cent, Tunisia 6 per cent, Turkey 6 per cent and so on. However, Greece and Spain are the two leading producers, the first produce mostly the black olives and the second dealing mainly with the green olive production.

Shemlali olive variety is one of the best varieties used for oil extraction. This variety proved to yield higher

oil percentage and it is found in almost all the groves around Sfax (Tunisia); and it was introduced to Egypt from Tunisia in 1917. Nowadays, Shemlali olive trees are the most common fruit trees cultivated in the northern coastal belt of U.A.R.

Flower bud differentiation is quite important to olive production, and it is well known that flowering is an important stage in a plant's life. It is obvious that, the transitional stage – where the vegetative growth is shifted to the generative development – embodies the essential formative processes necessary for the development of sexual reproduction and alteration of generations. Full details concerning such development were not yet explored. Hence, it was inevitable to study the effect of nitrogen fertilization on the timing and rate of flower bud differentiation. On the other hand, the carbohydrate-nitrogen balance in olive tree and its relation to cropping still need further studies. For that, it was quite imperative to concentrate also on studying the seasonal changes of carbohydrate-nitrogen fractions in both olive leaves and shoots all over the growing season.

Consequently, this study was conducted to know more about the carbohydrate-nitrogen balance in Shemlali olive tree in relation to flower bud differentiation, leaf anatomy, cropping and olive oil metabolism as affected by nitrogen levels, under U.A.R. conditions.

REVIEW OF LITERATURE

It is well known in olive trees that carbohydrate-nitrogen levels, in both leaf and shoot, are important indicators in judging the nutritional status of the tree. Accordingly, it is quite important to know more about the seasonal changes of both.

1.- Leaf and Shoot Nitrogen Content and its Seasonal Changes

Castorina (1932), mentioned that the nitrogen content and concentration of sap in olive leaves were higher at the time of flowering than when the fruits were swelling. With the strongly vegetative and rather unproductive variety Cucco, however, the nitrogen content and concentration of the sap were higher in summer than in spring, and were in all cases higher than those of veriety Dutta.

Bouat et al (1953), reported that there was a continuous demand for nitrogen from growth flush to stone hardening, and stone hardening marks an important point in the annual cycle. They added that nitrogen content in olive leaf was high at the beginning of spring growth and the leaf nitrogen falls down to the time of ripening. They found that the younger the leaf the higher its nitrogen content.

Palmy (1968), in Lebanon, reported that the leaf nitrogen content of Souri olive was high during the winter preceding the on-year, droped after fruit set in summer, and then increased to reach a high level in the summer of the following off year.

Prevot and Buchmann (1960), studying the foliar diagnosis of irrigated olive trees, found that leaves of productive branches had distinctly lower content than leaves of vegetative branches. The nitrogen content was higher for trees in annual production than for trees in alternate production. Nitrogen content rose at the end of growth and fell sharply from January to April, the nitrogen concentration fell after flowering and increased again at ripening.

Nour (1967), in Egypt, working on the seasonal changes of leaf nitrogen content in Shemlali olive tree indicated that there was an increase in total nitrogen per leaf during the growing season, except from July to August where an obvious decrease was noticed. Leaf nitrogen curves as percentage of dry weight, showed, however, a decreasing trend from the beginning of the growing season till August.

II.- Carbohydrate content, its seasonal changes and relation to yield

In an experiment on the Mission olive in Japan, Noro (1926), found that on branches which were girdled, 55 per cent of the flowers were perfect, while check branches had about 10 per cent perfect flowers. The carbohydrate content of the girdled branches was 39 per cent, while that of the non-girdled branches was 37 per cent. He stated that a high carbohydrate and low nitrogen level in the branches was associated with the production of perfect flowers.

Anagnostopoulos and Galanos (1933), analysed the leaves and twigs of olive trees. They found that the presence of adequate nitrogen in conjunction with carbohydrates, helped healthy vegetative growth but hinders fruiting. Moreover, where the carbohydrate-nitrogen ratio was high, both growth and fruitfulness suffer; but when the same conditions prevailed after fertilization of flower and formation of fruits (on ringed branches), the fruits contained more oil than under the condition of decreasing the nitrogen.

The data obtained by Sokolova (1939), on the olives indicated that floral abortion is very determined by the condition of leaves and the nutrient supplies in the soil.

In California, Hartmann (1950), found that girdling was most effective when done during the winter months (December, January, and February), where it resulted in a higher percentage of perfect flowers. Considering that differentiation of olive flowers begins about March 15, it is possible that girdling done several months earlier may make available to the developing olive flower a level of carbohydrates higher than normal and thus lead to a smaller amount of pistil abortion and therefore, to a higher percentage of perfect flowers at an anthesis. He also reported that alternate bearing in the olive was not prevented by girdling trees during the winter months preceding the off year.

III.- Flower Bud Differentiation

According to Morettini (1950), bud differentiation in olives occurs 40 to 60 days before flowering, but Almeida (1958), indicated that it takes place 90 days preceding the flowering.

Hartmann (1951), studied the time of flower differentiation in three olive varieties from five different localities, he found that the flower differentiation occurred in March about eight weeks before full bloom.

Moro and Inoue (1952), experimenting with the Mission olive variety, considered the date of flower bud initiation on which sepal primordia were first observable and the time of inflorescence initiation as that on which the terminal bud differentiated into three flower buds. The two events both occurred on 25 April in 1951, full bloom following on 3 June. In 1950 the dates of flower initiation and full bloom were 17th of April and 28th of May, respectively.

Sergeeva (1952), reported that flower bud differentiation in olive trees occurred about 2 months preceding full bloom.

Hartmann and Hoffmann (1953), studying flower bud differentiation in olives, they found that it occurred in mid-March but full bloom occurred in mid-May, i.e., eight weeks later.

Microscopic examination of flower bud differentiation was carried out by Panetsos (1958). He pictured the buds from the apex of the lowest lateral branch of the inflorescence since this develops earliest of all the branches. It was possible to observe flower bud development from the end of January until full bloom (three months).

Tomaselli (1960), found that flower bud differentiation began in mid-February in the Ascolano olive variety, a few days earlier in Lea, and during the second week of March in Carboncella varieties.

Nasr and Minessy (1966), found that bud differentiation in olives took place in December in the Shemlali variety in U.A.R.

Boulos (1966), observed that the flower bud in Shemlali olive trees at Borg El-Arab began to differentiate at the beginning of January, and it remained dormant till the beginning of March. The flower organs appeared and developed in two weeks before flower opening.

Troncoso (1967), working on the differentiation of olive flower buds in the region of Pisa, found that until mid-February the internal structure of the apical tissues was the same in all buds, but after that date centers of activity were apparent in the axial region of buds which eventually formed inflorescences.

Desouky (1970) in Egypt, studied the flower bud induction in Shemlali olive tree, he found that there was definitely no induction before December. By the end of January about 80% of floral induction was completed, the rest (20%) occurred sometime afterwards. The great majority of induction (60%) took place during January.

El Azzouni et al (1970), stated that the bud burst in olives was divided into definite successive stages. It was impossible to recognize the leaf from the fruit bud until the third stage of burst. The process of leaf bud burst could be divided into five, while that of the fruit bud into six stages

IV.- Factors affecting flower bud differentiation :

Marcucci (1950), found that the stimulation of the cryptophase was not sufficient to ensure production unless