EFFECT OF ETHREL ON GROWTH AND DEVELOPMENT OF TOMATO (LYCOPERSICON ESCULENTUM MILL)

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ABSTRACT

2 chloroethane phosphoric acid (Ethrel) at 10, 50, 100, 250 or 500 ppm. were applied as foliar spray on tomato seedlings two weeks after transplanting. Ethrel reduced shoot height, leaf area and flowering at all tested concentrations. However, at concentrations of 10 and 50 ppm ethrel significantly (P = 0.05) increased the number of leaves. Ethrel decreased the fresh weight and diameter of tomato fruits at all concentrations tested. The best results with regard to fruit size, number and weight were obtained with Ethrel at concentrations of 10 ppm.

Keywords: *Lycoperscon esculentum*, **Growth, Development, Ethrel.**

INTRODUCTION

Ethrel (2-chloroethane phosphoric acid) is a new class of plant growth regulator. It has been discovered at the culmination of an extensive synthesis and testing programme (Cook and Randall, 1968). Existing reports have shown that the effect is similar to those produced by ethylene and this has been attributed to the liberation of ethylene gas in *vivo* by ethrel (Cooke and Randall, 19868; Nowak and Lawson, 1983; Shine *et al.*, 1991).

Phillips (1971) reported that ethrel can regulate plant metabolism and produce desired physiological effect at different growth sites such as buds, leaves, roots and barks. Dozier and Barden (1973) found that Ethrel reduced expansion as well as total number of leaves and that the effective concentrations become lower as the growing season progressed. Oyebade (1975) observed that ethrel at 1000 ppm suppressed shoot elongation of the seedling of *Coffea canephoran* while at 250 and 500 ppm increased the seedlings height.

Vegetables are generally famous for the role they play as sources of minerals especially calcium, phosphorus and iron. Vitamins especially the A and C groups are also derivable from many vegetable types. Some vegetables are also rich in protein while others are good carbohydrate sources (Purseglove, 1974).

Tomato (*Lycopersicon esculentum* Mill.). is a vegetable of immense popularity and substance in Nigeria. It is widely cultivated around the Guinea and Sudan savannah ecological Zones (Bodunde, 1993). It holds industrial promise as a source of raw materials, though a large chunk of total production in Nigeria goes into culinary uses in homes. Production and Research on tomatoes in Nigeria have covered many aspects of its growth, it environmental requirements, pest and disease control, weed control, variety screening, variety recommendation, variety improvement and yield enhancement (Bodunde, 1993). Concerted efforts in the areas of research and productions enumerated above have resulted in better knowledge of the crop, improved management practices and increased yield. However, the crop continues to attract more research and production attention as challenges continue to

As part of the efforts geared towards maximizing the production of tomato, the present study was designed to identify the economic dosage(s) or concentration of ethrel that would promote significant growth and yield of the tomato crop.

MATERIALS AND METHOD

Seeds of (*Lycopersicon esculentum* Mill.) variety 158-3 were obtained from the National Horticultural Research Institute Ibadan, Nigeria and a nursery was raised in wooden flats filled with loamy garden soil. Fertilizer (NPK 15:15:15) was applied at the rate of 25kg per metre to the nursery beds and applied into the soil before sowing (Bako and Olatinwo, 1990). Transplanting was done three weeks after sowing into large polyethylene bags containing loamy garden soil. Six grams of NPK (15:15:15) fertilizer was applied to each polyethylene bag each containing one seedling of tomato.

The seedling were sprayed weekly with Dithane M45 (dithio carbamato fungicide) at the rate of 16g to 9 litres of water to control fungal diseases and with vetox 85 (a carbaryl insecticide) at the rate of 16g in 9 litres of water to control white flies (*Bemisia tabcci*) and other insects which transmit the tomato virus (Delana, 1974). Ethrel was used as foliar spray at concentrations of 10, 50, 100, 250 and 500 ppm while distill water (0 concentration of Ethrel) was used as control.

Spraying was carried out two weeks after transplanting and thereafter twice weekly. Treatments were maintained in an open environment with a 12 hour day and alternating 28$\pm$3°C day and 20$\pm$2.5°C night temperatures. Hoagland nutrient solution was applied to the plants once a week to supplement the mineral requirements of the plant. Treatments were replicated four times and arranged in a simple randomized complete design.

From 6 weeks after sowing, samples were taken weekly. At each sampling period four plants were selected at random from each treatment and the following measurements were determined: Height of the main shot, number of leaves, number of flowers, leaf area, fresh weight of fruits, diameter of fruits and number of fruits per plant. Leaf area was measured by the disk method (Gunkel and Mulligan, 1953). One hundred whole disk were taken using a punch with a cross-sectional area of 1.57 cm^2. The leaf area of the samples were calculated using area/weight relationship. Data were subjected to analysis of variance and the means compared by the least significant difference test at 5% level of significance.

RESULTS AND DISCUSSION

Plant shoot height was decreased significantly (P=0.05) by the application of Ethrel at all concentrations when compared with the control (Fig. 1). This supports the findings of Dazier and Barden (1973) who founded that ethrel reduced the plant height of young apple tree. However, this is at variance with the report of Oyebade (1975) who reported that Ethrel at 250 and 500 ppm increased the height of Coffee seedlings and that it was only suppressed at 1000 ppm. The differences in the findings may be due to differences in age of plants used or the mode of ethrel application since Oyebade (1975) applied ethrel directly to the seed while in this present work ethrel was applied as foliar spray on the young seedlings. Ethrel at lower concentration were more effective in causing significant increase (P=0.05) in leaf area than at higher concentrations (Fig. 2). Since weight and diameter were higher when leaf area was high at growth and maturation stages suggesting that the higher the leaf area at growth and maturation, the better the yield of the crop. Falcon (1972) working on cotton reported that during the period of plant establishment, cotton could suffer great reduction in leaf area without economic damage to the plant but that leaf area becomes important during the fruit formation period when the plant has the greatest uptake and utilization of water and nitrogen.

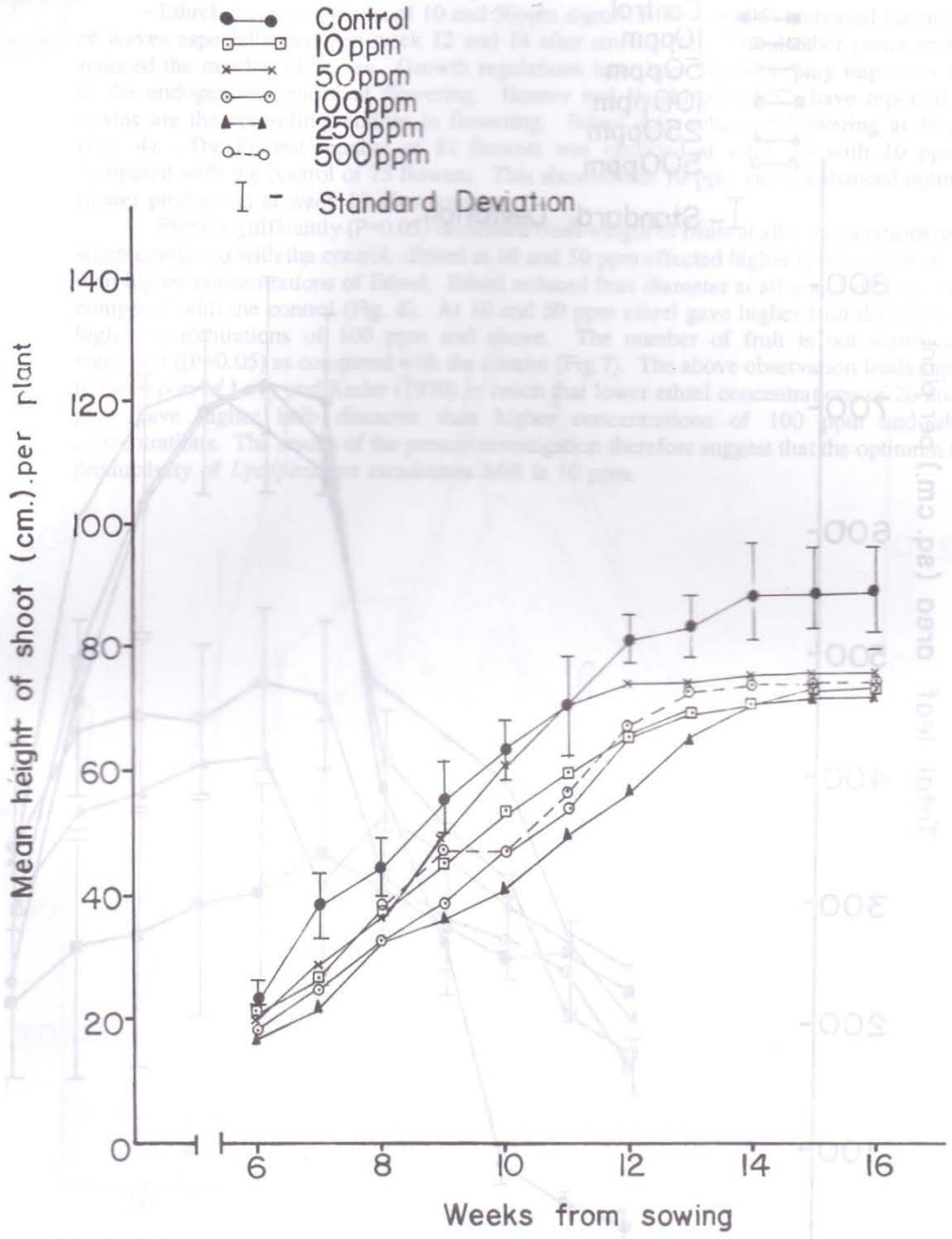

Fig. 1: Effect of Ethrel on the shoot height of *Lycopersicum esulentum* (mill)

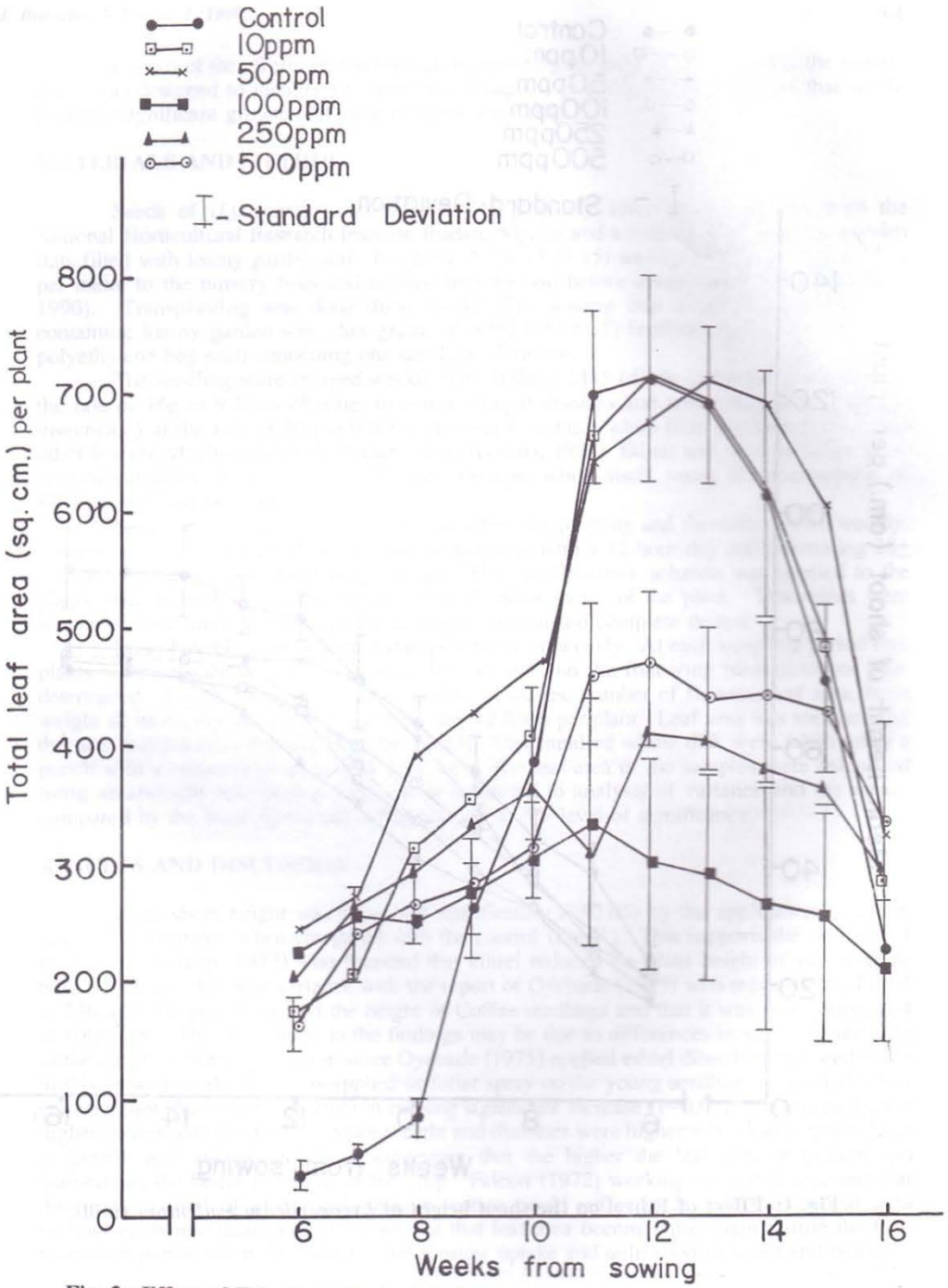

Fig. 2: Effect of Ethrel on the total leaf area of *Lycopersicum esulentum* (mill)

Ethrel st concentrations of 10 and 50ppm significantly (P=0.05) increased the number of leaves especially between week 12 and 14 after sowing (Fig. 3) but other concentrations reduced the number of leaves. Growth regulations have been found to play important roles in the endogenous control of flowering. Bonner and Bandurski (1952) have reported that auxins are the controlling entities in flowering. Ethrel only enhanced flowering at 10 ppm (Fig. 4). The highest number of 81 flowers was obtained at week 13 with 10 ppm as compared with the control of 75 flowers. This showed that 10 ppm ethrel enhanced optimum flower production at week 13 after sowing.

Ethrel significantly (P=0.05) decreased fresh weight of fruits at all concentrations tested when compared with the control. Ethrel at 10 and 50 ppm effected higher fresh weight of fruit than higher concentrations of Ethrel. Ethrel reduced fruit diameter at all concentrations when compared with the control (Fig. 6). At 10 and 50 ppm ethrel gave higher fruit diameter than higher concentrations of 100 ppm and above. The number of fruit is not significantly increased ((P=0.05) as compared with the control (Fig.7). The above observation leads support to the report of Levy and Kedar (1970) in onion that lower ethrel concentrations of 20 and 40 ppm gave higher bulb diameter than higher concentrations of 100 ppm and above concentrations. The results of the present investigation therefore suggest that the optimum fruit productivity of *Lycopersicon esculentum* Mill is 10 ppm.

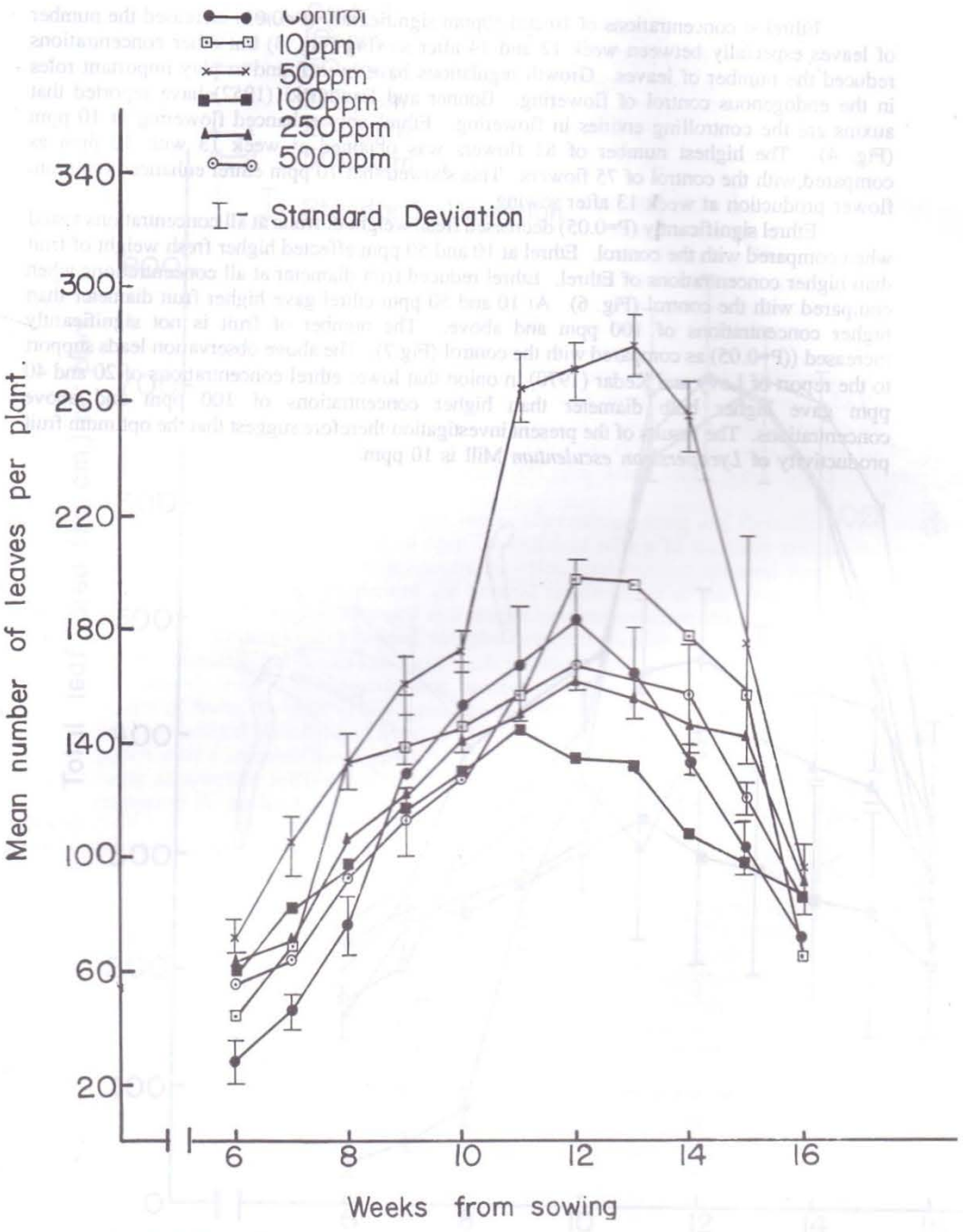

Fig. 3: Effect of Ethrel on the number of leaves of *Lycopersicum esulentum* (mill)

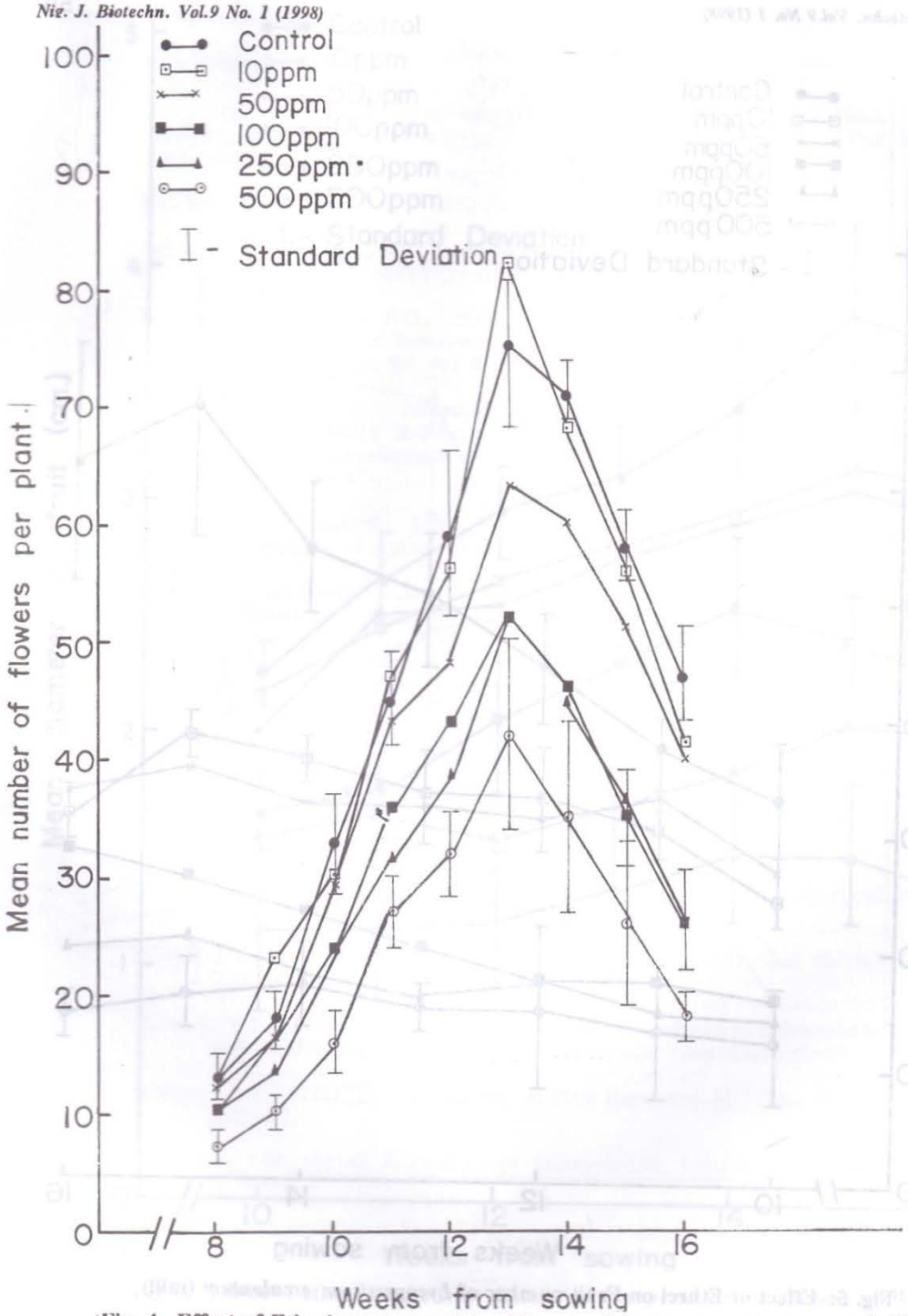

Fig. 4: Effect of Ethrel on the number of flower of *Lycopersicum esuientum* (mill)

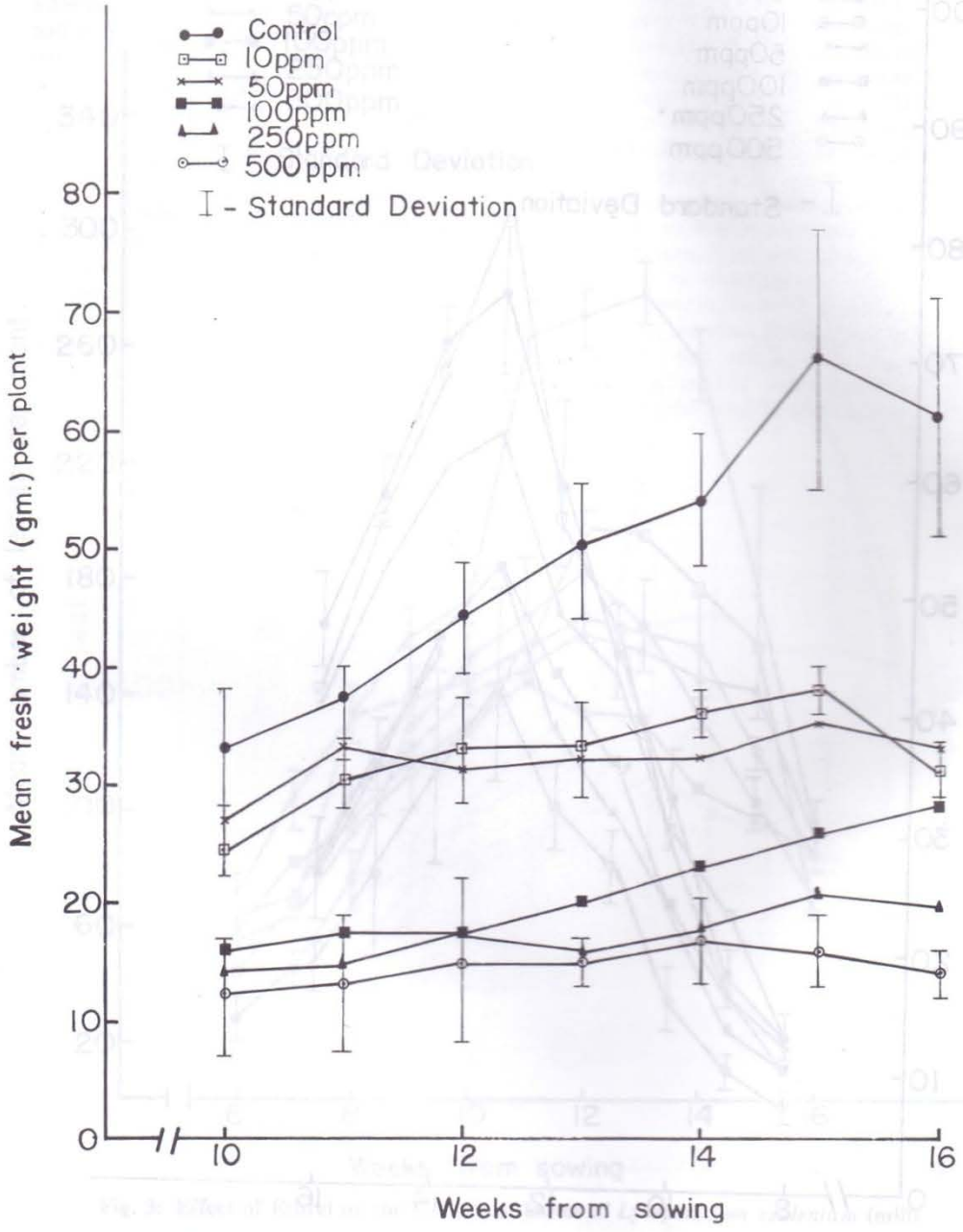

Fig. 5: Effect of Ethrel on Fruit number of *Lycopersicum esculentum* (mill)

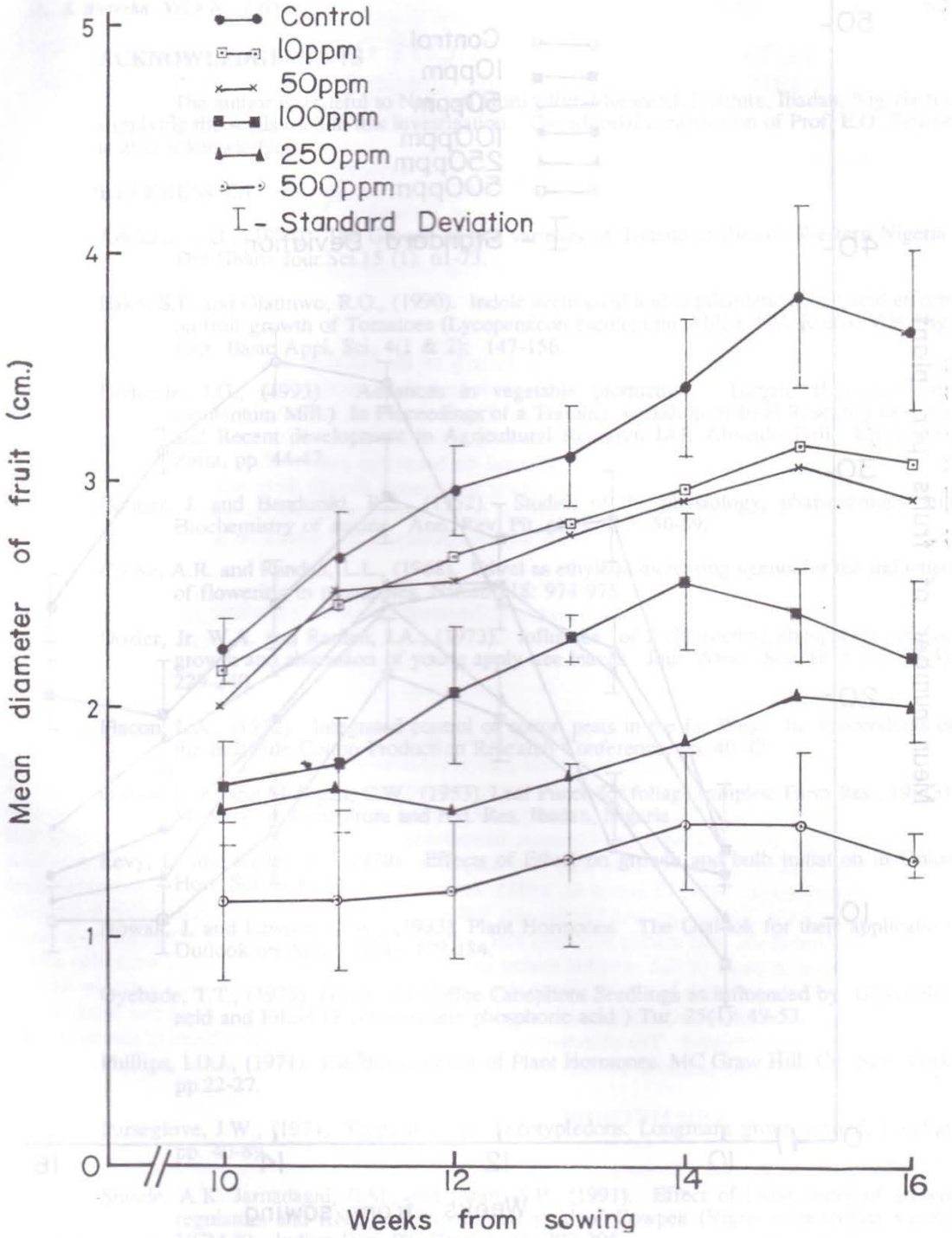

Fig 6: Effect of ethrel on the fruit diamter of *Lycopersicum esculentum* (mill

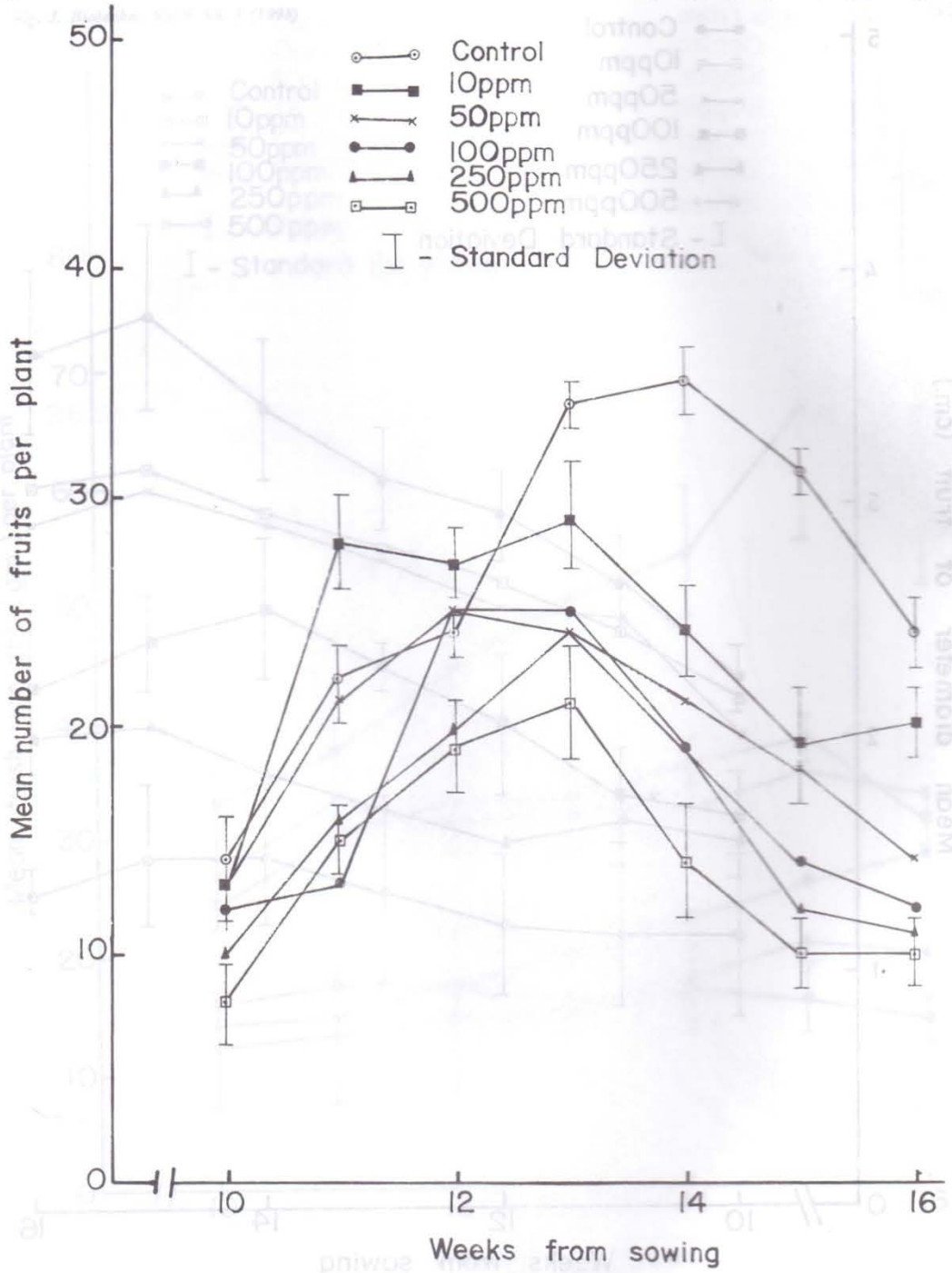

Fig. 7: Effect of Ethrel on the fresh fruit weight of *Lycopersicum esculentum* (mill).

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