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EFFECT OF AGRICULTURAL PRACTICES AND AGROCHEMICALS ON GROWTH AND YIELD OF WHEAT (*Triticum aestivum* L.)

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ABSTRACT

Field experiments were performed in Borg El-Arab region, west Alexandria - Egypt during 2001 and 2002 seasons under surface and drip irrigation systems to investigate the effects of foliar applied herbicide (fenoxaprop-p-ethyl), four foliar applied insecticides (pirimicarb, fenitrothion, cypermethrin and malathion), farmyard manure (FYM), four phosphorus levels (0, 15, 30 and 45 kg P_2O_5/Fed.) and three row spacings (20, 25 and 30cm) on growth and yield of grain and straw of wheat. The commercial formulation for the previous pesticides were individually foliar sprayed after sowing. Fenoxaprop-p-ethyl applied at different rates (100, 200, 300, 400 and the recommended rate of 500 cm^3/Fed). Malathion was applied with two rates of 75 and the recommended rate of 150 cm^3/Fed. The recommended rates of other pesticides were individually foliar sprayed. FYM and four phosphorus levels were applied on land preparation before sowing. Results indicated that pesticides were effective only at high rates, plant height and yield of grain and straw were significantly increased in fenoxaprop-p-ethyl especially at rates from 500 to 300 cm^3/Fed. under surface and drip irrigation systems compared with control in 2001 and 2002 seasons. Fenoxaprop-p-ethyl with FYM gave the highest significant increase in plant height and yield of grain and straw followed by fenoxaprop-p-ethyl alone while FYM alone was the least effective compared with control in 2001 and 2002 seasons under either surface or drip irrigation system. For fenoxaprop-p-ethyl with FYM mean values were 66 and 66 cm for plant height and 13.335 and 13.335 ardab/Fed. for grain yield and 3.880 and 3.865 ton/Fed. for straw yield compared with control 37 and 37 cm for plant height and 10.100 and 10.025 ardab/Fed. for grain yield and 2.565 and 2.560 ton/Fed. for straw yield for 2001 and 2002 seasons, respectively under either surface and drip irrigation systems. Concerning the effect of insecticides, using row spacing 10 cm and phosphorus level 15 kg (P_2O_5), plant height, yield of grain and straw were significantly increased in case of pirimicarb treatment followed by fenitrothion while cypermethrin was the least in the two seasons. For pirimicarb the average values for grain yield were 13.565 and 13.530 ardab/Fed., for finitrthion were 12.675 and 12.655 ardab/Fed., for cypermethrin were 11.250 and 11.240 ardab/Fed. compared with the control which gave 10.035 and 10.275 ardab/Fed. in 2001 and 2002 seasons, respectively. Plant height and yield of grain and straw were significantly higher in malathion treated wheat especially at higher rate 150 cm^3/Fed. followed by the rate 75 cm^3/Fed. compared with the control. Application of phosphorus levels especially at rate 30kg P_2O_5/Fed. with spacing 20 cm increased significantly plant height and yield of grain and straw under surface and drip irrigation systems in the two seasons mentioned above. In all trials plant height and yield of grain and straw of wheat significantly increased in surface irrigation than drip irrigation systems in the two seasons.

Keywords : wheat, pesticides, soil, fertilizer, crop, growth, variability, Ineviable, risks, critical, puplic, health, issue, scant, products, contamination, nutritions.

INTRODUCTION

Wheat is the main winter cereal crop in The Arab Republic of Egypt (A.R.E.) and its storage is the dominant factor in our food problem. Therefore, the total cultivated area as well as the total grain production are of the utmost importance (Heggy *et al*., 1992).

At present, efforts are devoted to increase food and agricultural production, mainly through the increase in cultivated area and also through efficient use of fertilizers. In certain soils, besides micronutrients may become a limiting factor in crop production, particularly in newly reclaimed areas, especially in sandy and calcareous soils. At present, about 150000 Feddans are being prepared for rainfed wheat cultivation at Sinai (sandy soil) and north western coast of the Nile Delta (Ghaly *et al*., 1993). Hence, fertilization and irrigation factors are of great concern for obtaining high yield (Heggy *et al*., 1992). Viets (1967) and Newbould (1969) revealed that soil water levels play a very important role in nutrient availability. Numerous investigators have been concerned with wheat fertilization. Poltavskaya and Kolvalenko (1981) reported that phosphorus fertilizers tended to increase grain protein contents. Kene *et al*. (1985), also showed that addition of K_2O to NP gave further significant increase in yield and protein content. Aslam Main and Ali (1990) indicated that NP application compared to N alone caused a significant increase in yield and yield components of rice and wheat. Several studies were carried out to determine the chemical composition of cereals and their products. Also, the relationship between chemical composition and nutritional value of cereals products was obtained by Gesloff (1963) who found large qualitative and quantitative differences in mineral requirements of plants. Dikeman *et al*. (1981) and Promeranz and Dikeman (1983) analyzed some wheat composite samples for ash, protein, P, K, Mg, Ca, Zn and Fe and investigated the effect of fertilization on their content. They reported that the addition of these elements to fertilization mixture increased both yield and elements contents of wheat product. Migozoma and Yashida (1989) reported that phytate significantly decreased phosphorus and magnesium absorption while calcium absorption was not affected. Also, Abdel-Malak *et al*. (1997) indicated that means of plant height and number of fruiting branches in cotton plants, tended to increase with the higher levels of phosphorus in the three growing seasons (phosphorus rates P_2O_5/Fed.: zero, 15, 22.5 and 30 in 1993,1994,1995). This may be due to the role of phosphorus on plant metabolism and development (Epestein, 1971). Similar results were obtained by Hamissa *et al*. (1980); Radwan and Abdel-Malak (1995); Abdel-All *et al*. (1996) and Ali *et al*. (1996). The increase in cotton yield / plant at higher dose of P_2O_5 was due to the increase in the number of open bolls / plant and boll weight. These results may be due to the fact that higher doses of phosphorus encourage plant growth as a result of increasing photosynthesis and plant metabolism. Also, phosphorus acts as an activator of some enzymes which may affect boll formation and stability (Epestein, 1971). These results are in line with those obtained by Girigs *et al*. (1993); Radwan and Abdel-Malak (1995) and Ali *et al*. (1996).

Applying farmyard manure (FYM) to soil resulted in a pronounced effect on increasing growth of wheat. Several investigators discussed the role of FYM application. El-Shafie (1989) indicated that the highest dry matter and crop yield of wheat were obtained by addition of FYM. Also, Bhata and Shukle (1982) reported that grain yield of wheat was higher with FYM than mineral fertilizers. Moreover, Dahroug *et al*. (1992) and Derar and Gendy (1994) found that addition of FYM significantly increased the straw and seed yield and some constituents of chick pea and broad bean. Also, dry and fresh forage yield of cowpea and sudan grass was significantly increased by application of organic manure (Abdel-Gawad *et al*., 1992). These results are in harmony with Abu El-Azm *et al*. (1996) they showed that wheat yield increased by fertilizer. These results may be due to the beneficial effect of organic matter on soil properties by improving the soil moisture content also due to its contribution to the needs of plant from both macro and micro nutrients.

Water is a critical and vital factor for growth, yield and quality of crops. Successful management of irrigation water is necessary to achieve high yield (Foti *et al*., 1995; Awari and Hiwase, 1996 and Boujelben *et al*., 1997).

Agricultural practices are very important to obtain high quality and quantity yield of crops. Several authors reported that certain agricultural practices i.e. nitrogen fertilizer, sowing date and spacings reduce the population density of dipterous pests. Rawat and Sahu, 1969; De Bach, 1974 and D`Aguilar *et al*., 1978 on wheat and Bethke *et al*., 1987 and Hanna *et al*., 1987 on tomato and Yein and Das, 1990 on rice.

Pesticides treatment led to significant increase in yield in many situations. Many investigators dealt with pesticides application. Pommer (1991) showed that chemical pesticides significantly resulted in high yield of winter wheat and sugarbeet. Also, Salem and El-Sherif (1998) found that pirimicarb and chloropyrifos-methyl significantly increased total green yield of broad bean. In addition, Salem (1999a) showed that methomyl and profenfos significantly increased yield of lattuce. Also, Salem (1999b) indicated that pirimiphos-methyl and chloropyrifos-methyl significantly increased yield of tomato plant. Moreover, Salem *et al*. (2002) demonstr- ated that soil treated with either FYM or aldicarb or both, carbosulfan, chloropyrifos, traizophos, chloromiphos and foliar application of methomyl significantly increased plant height and both pods and haulms yield of peanut plant.

The purpose of this study is to discuss and interpret results of wheat crop obtained from the field experiment conducted at the newly reclaimed areas at Borg El-Arab region at north western coast of the Nile Delta, west of Alexandria for studying the effect of certain pesticides, farmyard manure, soil application of inorganic fertilizer (phosphorus levels) and spacings on wheat growth and yield under surface and drip irrigation systems during 2001 and 2002 seasons.

MATERIALS AND METHODS

Pesticides used :

Pesticides used included the herbicide (fenoxaprop-p-ethyl) and the insecticides (pirimicarb, fenitrothion, cypermethrin and malathion) , the common name, trade mark, formulation, recommended dose, chemical name and origin of pesticides used are tabulated in Table (1).

Field experiment :

Field trials were conducted under surface and drip irrigation systems from 20th November to 20th April for 2001 and 2002 seasons. Experiments were conducted at the newly reclaimed agricultural soils at Borg El-Arab region, west Alexandria. Treatments were designed in complete randomized plots with three replicates in an area of 1/50 Feddan. Soil are sandy clay loam (sand 53.58%, silt 20.62%, clay 25.53% available P 13.5 mg/kg, total N 0.06 mg/kg, pH 8, EC 0.980 dS m^{-1} (Page *et al*.,1982).

Wheat variety :

Wheat (*Triticum aestivum* L.) variety (Sakha 61) was drilled in rows by hand at the rate of 60 kg/Fed.

Sowing and harvesting :

Wheat seeds were sown in the 20^{th} November. All normal agricultural practices were followed. Experiments were conducted under either surface or drip irrigation systems during 2001 and 2002 seasons. All plots were harvested at maturity. Grain and straw yield were recorded at the end of each season.

Assessment of plant growth and yield of grain and straw :

Plant growth was examined at weekly intervals. At maturity, five plants were arbitrarily selected from each replicate and plant lenght of main stem from soil surface to the ear base were recorded. Grain yield (ardab/ Fed.) and straw yield (ton/Fed.), were recorded at the end of each season under surface and drip irrigation systems.

Effect of fenoxaprop - p - ethyl :

25 days after sowing, plants were sprayed with commercial formul- ation of the herbicide fenoxaprop-p-ethyl at different rates (100, 200, 300, 400 and 500 cm^3/Fed.with 200 liter water). Commercial formulations of herbicide were applied using a knapsack sprayer equipped with one nozzle, normal agricultural practices were performed. Effect of plant spray treatment with fenoxaprop-p-ethyl were investigated under surface and drip irrigation systems during 2001 and 2002 seasons. Untreated plots served as control. Plant growth and yield were recorded.

Effect of farmyard manure (FYM) and fenoxaprop-p-ethyl :

Effect of FYM (20 cm^3/Fed.) and fenoxaprop-p-ethyl (500 cm^3/Fed. with 200 liter water) on growth and yield of wheat plant were investigated under surface and drip irrigation systems during 2001 and 2002 seasons.

Field plots were treated with FYM at land preparation or plant sprayed with fenoxaprop-p-ethyl after 25 days from sowing or both, but untreated plots were served as control. No additional fertilizer was added to the plots. Normal agricultural practices were followed uniformally. Effect of FYM and/or fenoxaprop-p-ethyl treatments on growth and yield of wheat plant were investigated.

Effect of insecticides :

1- Effect of pirimicarb, fenitrothion and cypermethrin :

Three foliar insecticides were applied with their commercial formul-ation according to the recommended rates of 31.2 g, 250cm^3 and 50 ml/Fed. with 100 L. water, for pirimicarb, fenitrothion and cypermethrin, respectively after 20, 35 and 50 days of sowing.

2- Effect of malathion :

Foliar application of theinsecticide malathion was performod at the recommended rate of 150 cm^3 and half the recommended rate of 75 cm^3/Fed. with 100 L. water after 20, 35 and 50 days from sowing.

Commercial formulations of the four insecticides were applied using knapsack sprayer equipped with one nozzle. Row spacing was 10 cm and phosphorus fertilizer level 15 kg P_2O_5 was used in the form of supper phosphate (15% P_2O_5) before sowing for all plots of experiment and control. Other normal of agricultural practices were followed. Residual effect of five treatments for the four insecticides on crop growth and yield of grain and straw under surface and drip irrigation systems during 2001 and 2002 seasons were recorded.

Effect of phosphorus levels and row spacings :

Experimental treatments were 12 representing combinations of four phosphorus fertilizer levels (0, 15, 30 and 45 kg P_2O_5/Fed.) and three row spacings (20, 25 and 30 cm). Phosphorus fertilizer was used in the form of supper phosphate (15% P_2O_5) and applied before sowing. No insecticides treatments were used in these plots, other normal agricultural practices were followed uniformally. Experiments were conducted under surface and drip irrigation conditions during 2001 and 2002 seasons. Plant height and grain and straw yield were investigated.

Statistical analysis :

Statistical analysis of the data was made according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

Effect of fenoxaprop-p-ethyl and farmyard manure (FYM) :

Treatment with fenoxaprop-p-ethyl greatly reduced variation in plant growth and increase grain and straw yield in the two experimental seasons under surface and drip irrigation systems. Average values, in Table (2) indicated that plant height and yield of grain and straw were significantly increased when fenoxaprop-p-ethyl was applied at recommended dose (500 cm^3/Fed.) under surface and drip irrigation systems compared with the control in 2001 and 2002 seasons. Mean values for plant height of surface and drip irrigation systems were 63.50 and 63.50 cm. compared with control 37.50 and 35.00 cm. for seasons 2001 and 2002, respectively.

For grain yield the average values were 13.26 and 13.315 ardab/Fed. compared with the control 10.005 and 9.885 ardab/Fed. For the seasons 2001 and 2002, respectively. In respect of straw yield, mean values were 3.825 and 3.820 ton/Fed. compared with the control 2.55 and 2.54 ton/Fed. under surface and drip irrigation systems for 2001 and 2002 seasons, respectively. From Table (2) it was shown that fenoxaprop-p-ethyl was effective only at high rates. Plants were apparently normal and vigorous, plant height and yield of grain and straw were significantly increased compared with the control especially in Fenoxaprop-p-ethyl treated plots at the rates of 500 to 300 cm^3/Fed. (Table 2). Average values in Table (2) demonstrated that plant height, grain and straw yield significantly increased in surface irrigation than drip irrigation system in the two seasons, which were 51.83, 45.50, 51.16 and 43.83 cm. for plant height and 11.62, 10.623, 11.514 and 10.62 ardab/Fed. for grain yield and 3.151, 2.983, 3.163 and 2.974 ton/Fed. for straw yield, for surface and drip irrigation system for seasons 2001 and 2002, respectively. This results are in agreement with those obtained by Varma (1976) who reported that the nutrient uptake by some cereal and leguminous crops increased with increasing moisture content.

Plants in the plots treated with fenoxaprop-p-ethyl and FYM showed vigorous and healthy in growth characters. Average values in Table (3) showed that the plots treated with fenoxaprop-p-ethyl and FYM gave the highest significant increase in grain and straw yield as well as plant height under surface and drip irrigation systems followed by fenoxaprop-p-ethyl alone and FYM alone compared with control in 2001 and 2002 seasons. For plots treated with fenoxaprop-p-ethyl and FYM mean values were 66 and 66 cm for plant height and 13.335 and 13.335 ardab/Fed. for grain yield and 3.880 and 3.865 ton/Fed. for straw yield compared with control 37 and 37 cm for plant height and 10.100 and 10.025 ardab/Fed. for grain yield and 2.565 and 2.560 ton/Fed. for straw yield for surface and drip irrigation systems in the two seasons 2001 and 2002, respectively. These results are in coincidence with Dahroug *et al*. (1992) and Derar and Gendy (1994), they reported that addition of FYM led to significant increase in straw and seeds yield and some constituents of chickpea and broad bean. Also, these results are in agreement with Abu El-Azm *et al*. (1996) who showed that the wheat yield increased by fertilizer. Moreover, these results are in harmony with Salem *et al*. (2002) who showed that treatment of peanut with aldicarb and FYM gave the highest significant increase in plant height and pods and haulm yield under surface and drip irrigation systems followed by aldicarb alone and FYM alone compared with the control in both 2000 and 2001 seasons. These results may be due to its effect on raising the availability of nutrients in root media (Gati, 1982). Mean values in Table (3) demonstrated that plant height and grain and straw yield of wheat plant were significantly high in surface irrigation compared with the drip irrigation system in both the two seasons of 2001 and 2002. These results are in accordance with those obtained by Sabra (1993) who found that glyphosate, glyphosinate, paraquat, bentazon, dicofop-methyl and haloxyfop-butyl increased potato tuber yield. Also, El-Sherief and Salem (1998) showed that metribuzin and glyphosate increased significantly potato tubers.

These results are in accordance with Ali *et al*. (1983) and Pombo *et al*. (1985) who found that the herbicide usage led to increasing seedlings growth and finally the yield, this may be due to the fact that weed compete with growing plants and reduce growth and yield.

Effect of foliar application of insecticides :

Effect of pirimicarb, fenitrothion and cypermethrin :

Plots treated with pesticides showed healthy and uniform plant growth especially those treated with pirimicarb. On the other hand, plants in untreated - plots were weak and less in height. Pirimicarb have the highest significant effect in increasing crop growth, grain and straw yield followed by fenitrothion but cypermethrin was the lowest one under surface and drip irrigation systems compared with the control in 2001 and 2002 seasons (Table 4). Average values of grain yield for pirimicarb were 13.565 and 13.530 ardab/Fed. for finitrothion were 12.675 and 12.655 ardab/Fed. for cypermethrin were 11.25 and 11.24 ardab/Fed. compared with control 10.035 and 10.275 ardab/Fed. under surface and drip irrigation systems for 2001 and 2002 seasons, respectively. Moreover, mean values of plant height and yield of grain and straw were significantly higher in surface irrigation than the drip irrigation system in 2001 and 2002 seasons (Table 4).

Effect of malathion :

Results in Table (5) indicated that average values of plant height and yield of grain and straw were significantly higher in malathion treated plots especially at the higher rate (the recommended rate) compared with the control plots under surface and drip irrigation systems in seasons 2001 and 2002. Mean values of plant height for malathion treatment at rate of 150 cm^3/Fed. were 67 and 68 cm and at rate 75 cm^3/Fed. were 56.50 and 54.50 cm compared with control 39 and 39 cm under surface and drip irrigation systems for 2001 and 2002 seasons respectively. For grain yield at the rate 150 cm^3/Fed. were 12.265 and 13.245 ardab/Fed. and at the rate of 75 cm^3/Fed. were 10.33 and 9.835 ardab/Fed. compared with the control 9.430 and 8.975 ardab/ Fed. under surface and drip irrigation systems for seasons 2001 and 2002, respectively. Average values of straw yield for malathion treatment at the rate of 150 cm^3/Fed. were 3.515 and 3.525 ton/Fed. and at rate of 75 cm^3/Fed. were 2.895 and 2.900 ton/Fed. compared with control 2.51 and 2.53 ton/ Fed. under surface and drip irrigation systems for 2001 and 2002 seasons, respectively. Average values of grain and straw yield in surface irrigation system was significantly increased compared with drip irrigation system for seasons 2001 and 2002, respectively. For grain yield, mean values were: 11.443 for surface irrigation compared with 11.573 ardab/Fed. for drip irrigation system, for the 2001 season and 10.903 for surface irrigation compared with 10.333 ardab/Fed. for drip irrigation system for the 2002 season. Average values of straw yield were 3.036 for surface irrigation compared with 2.91 ton/Fed. for drip irrigation system in the 2001 season and 3.05 for surface irrigation compared with 2.92 ton/Fed. for drip irrigation system in the 2002 season. Mean values of plant height in surface irrigation system were more than drip irrigation system in 2001 and 2002 seasons (Table 5).

These results are in agreement with those obtained by Maqbool *et al*. (1988) who reported that aldicarb significantly increased the yield of potato, also, Yanni (1992) indicated that diazinon at 15 kg/ha. gave the best rice plant performance and the highest grain yield. Hanyat *et al*. (1996) showed that grain yield was significantly increased by aldicarb and diazinon. These results may be attributed to the increase in number of healthy and survival plants, in addition pesticides have been found useful in obtaining significantly higher yield through the control of plant pests and diseases (Sinclair, 1979 and Omar and Rahhal, 1993).

Effect of phosphorus levels and row spacings :

Data in Table (6) showed that there were significant interactions between P levels X row spacings, this indicated that the two factors influenced plant height and yield of grain and straw under surface and drip irrigation systems in 2001 and 2002 seasons. Highest values for all the considered parameters, plant height and yield of grain and straw were taken place at the rate of 30 kg P_2O_5 /Fed. with 20 cm spacing compared with 0, 15 and 45 kg P_2O_5 /Fed. with 25 and 30 cm spacings under surface and drip irrigation systems in 2001 and 2002 seasons. Such results agrees with El-Serwy (1998) who showed that row spacing 20 cm and application of N at a rate of 60 kg/Fed. to wheat plant produced the highest grain yield. Also, Hagras (1985) and Eissa *et al*. (1995) indicated that row spacing 20 cm of wheat gave higher grain yield. Moreover, Zahran *et al*. (1998) showed that treatment of lentil and lupin plant with solution of soaked superphosphate (sp) alone at the rate of 5 kg/Fed. significantly increased yield components and both crops under study. i.e. plant height, number of branches and pods/ plant, pod weight/plant and seed index. In addition, Ali *et al*. (1996) showed that plant height, seed cotton yield/Fed., yield components, seed index and lint percentage were significantly increased as P_2O_5 level was increased. Moreover, the means of plant height and number of fruiting branches/plant tended to increase with the higher levels of phosphorus (P rates: zero, 15, 22.5 and 30 P_2O_5 /Fed.) (Abdel-Malak *et al*., 1997). In addition, Genaidy *et al*. (1992) showed that better maize yield was obtained by adding medium P rates before planting. This may suggest that narrow spacing and increasing rate of fertilizer lead to increasing pests (leafminer A-nigripes) infestation in wheat plant (El-Serwy, 1998). Similar results showed the effect of medium rate of phosphorus to increase grain yield of rice (Melgar and Ligier, 1986), rice (Roy and Jha, 1987), wheat (Dang *et al*., 1989), rice and wheat (Basak and Dravid, 1992). However, Abdel-Malak *et al*. (1997) showed that higher number of open bolls/plant, higher seed cotton yield/plant and heaviler bods were detected at higher phosphorus level, i.e. 30 kg P_2O_5 /Fed. in 1993 and 1995 seasons. These results may be attributed to the fact that higher doses of phosphorus encourage plant growth as a result of increasing photosynthesis and plant metabolism. Also, phosphorus acts as an activator of some enzymes which may affect boll formation and stability (Epestein, 1971). These results are in line with those obtained by : Girigs *et al*. (1993); Radwan and Abdel-Malak (1995) and Ali *et al*. (1996).

Growth variability problem is a syndrome and many factors (low pH, aluminum toxicity, nematodes, viruses, etc...) individually and or in combin- ation are responsible (Sharma *et al*., 1992). Chase *et al*. (1989) analyzed soil profiles of productive and unproductive millet (*pennisetum glaucum*) patches and observed that aluminum (Al) concentration correlated with poor millet plant growth. They suggested that plant variability within a field could be reduced by liming the top 30 cm of soil to reduce (Al) and manganese (Mn) toxicity and to increase phosphorus (P) availability. They have followed up the millet crop performance at Agricultural Research Center, Cairo, Egypt, over several years and mapped the fields to ascertain wheather variability within plots moved from one year to another. They observed that growth variability of millet yield moved from one year to the next and that P was not the cause of plant growth variability. However, all these workers have associated plant growth variability problems only with abiotic factors such as toxicity due to (Al) and (Mn), and/or nutrient imbalances of these soils. They have observed uniform good plant growth in plots at Aly Mubarak Experimental Farm at El-Bustan of the South Tahrir Research Station having a sandy soil type that had previously been planted with Cowpea. This led to the speculation that the added organic matter may be partly responsible for reducing plant variability. However, Baujard (1990) reported that nematicide dibromochloropropane (DBCP) decrease nemat-odes population densities and increase pods and haulms yield in peanut. Incidence of peanut clumb variability (PCV) was also reduced in pesticide treated plots.

In the present work, plant height and yield of grain and straw of wheat plant was significantly increased as a results of using pesticides under surface and drip irrigation systems in 2001 and 2002 seasons (Tables 2 to 5). This may be attributed to the fact that nutrients become available in the soil as a result of the presence of pesticides on the surface of the shoots of plant which enhancing some nutritional cycles responsible for nutrients uptake and transport (Peterson, 1987; Thomas, 1986; Nofal *et al*., 1988 & 1993; Sabra, 1993; Salem, 1994, 1997, 1999a & 1999b; Salem and El-Sherief, 1998; Salem and El-Sayed, 2002 and Salem *et al*., 2002). The reason of this high increase of plant height, yield of grain and straw of wheat plant as a result of the application of fenoxaprop-p-ethyl (Tables 2 and 3) may be attributed to the fact that weed compete with growing plants and reduce growth and yield. Thus, herbicide usage increased growth and yield and censequently the manual elemination of weeds is seldom practiced (Ali *et al*., 1983 and Pombo *et al*., 1985).

In the present investigation, the three insecticides used have been chosen from three different chemical groups: pirimicarb (from pyrimidin group), fenitrothion (from organophosphate group) and cypermethrin (from pyrethroid group) (Tables 1 and 4). Pirimicarb have the highest effect on increasing crop growth, grain and straw yield followed by fenitrothion while cypermethrin was the least under surface and drip irrigation systems compared with the control in the two seasons mentioned above (Table 4). Tn this work, it could be shown also that there was obvious correlation between the effect of the insecticides on crop growth and yield of grain and straw of wheat and the chemical structure, for example : fenitrothion and malathion are both from O.P. group (Table 1) and they have significantly the same effect on increasing growth and yield of wheat compared with the control in the two seasons mentioned above (Tables 4 and 5). Moreover, from data in tables 2 and 5, it was obvious that pesticides application produced the highest crop growth and yield of wheat at the higher rate (The recommended rate) in the two seasons.

In the present work, data (from Tables 2 to 6) showed that plant height and yield of wheat were significantly higher in surface irrigation than drip irrigation systems in the two seasons mentioned above. This results agrees with El-Banna *et al*. (2001) who found that furrow irrigation method increased plant height and yield of potato tuber than drip irrigation method. This findings may be attributed to the fact that water levels play a very important role in nutrients availability (Vites, 1967 and Newbould, 1969).

Previous results showed that application of insecticides at the higher rate (the recommended rate) especially in the case of pirimicarb using row spacing 10 cm and phosphorus level 15 P_2O_5 for all plots and control on wheat under surface irrigation system (Tables 4 and 5) or application of P at the rate of 30 kg P_2O_5 with 20 cm spacing without using insecticides under surface irrigation system (Table 6), significantly increased crop growth and yield of grain and straw of wheat compared with the control in the two seasons mentioned above.

In recent year, pesticides in Egyptian agriculture has been used on a wide scale, with their use came benefits as well as inevitable risks (Attalah and El-Deep, 1997). One of the most critical public health issues is contamination with pesticides. Scant attention has been paid to the problem of agricultural products and soil contamination with pesticides and fertilizer (Yang, 1987 and 1992).

Agricultural practices i.e. fertilization, spacing, irrigation systems…etc are easy, cheap, effective and safe methods for pest control as they altering the habitat to be less favourable for pests reproduction and survival. Such effect may be direct on the pest itself or indirect by encouraging natural enimes (El-Serwy *et al*., 1998).

In conclusion, the present results are greatly suppoprt our recommendation that further research is still needed to determine the optimum agricultural practices which menemizes the damage oh pests and to obtain high quality and quantity of the crop yield.

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تأثير العمليات الزراعية والكيمــاويات الزراعـية على النمو والإنتاجية لنباتات القمح

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أجرى هذا البحث التطبيقى الحقلى لدراسة تأثير مبيد الحشائش فينوكسابروب-ب-إيثيل بإستخدام التركيزات 100 ، 200 ، 300 ، 400 والتركيز الموصى به 500 سم^3 / فدان رشاً على الأوراق بعد الزراعة، وأربعة مبيدات حشرية (بريميكارب وفينيتروثيون و ثايبريمثرين و ملاثيون) بإستخدام التركيزات الموصى بها وهى 31.2 جرام ، 250 سم^3 ، 50 مل ، 150 سم^3 / فدان للأربعة مبيدات السابقة بالترتيب ، كما أستخدم أيضاً التركيز 75 سم^3 / فدان لمبيد الملاثيون رشاً على الأوراق بعد الزراعة والسماد العضوى (FYM) وأربعة مستويات مختلفة من الفوسفور (صفر ، 15 ، 30 ، 45 كجم فو$_2$أ$_5$ / فدان) تطبيقاً على الأرض قبل الزراعة وثلاثة مسافات (20 ، 25 ، 30 سم) على النمو ومحصول الحبوب والقش لنبات القمح (*Triticum aestivum* L.) والذى تمت زراعته بالأراضى المستصلحة الجديدة ببرج العرب بالساحل الشمالى - شمال غرب الإسكندرية - مصر- فى موسمىّ 2001 ، 2002م .

وقد أوضحت النتائج أن المبيدات المستخدمة يكون تأثيرها أكبر معنوياً فى التركيزات العالية حيث كان فينوكسابروب-ب-إيثيل لا يؤثر معنوياً فى النمو وزيادة إنتاج الحبوب والقش إلا فى التركيزات العالية من 300 إلى 500 سم^3/فدان فى كلا الموسمين المذكورين آنفاً تحت ظروف الرى السطحى والرى بالتنقيط. كما أظهرت النتائج أن تطبيق فينوكسابروب-ب-إيثيل مع FYM أعطى أعلى تأثير معنوى فى زيادة طول النبات وإنتاج الحبوب والقش يليه الفينوكسابروب-ب-إيثيل بمفرده بينما كان FYM بمفرده أعطى أقل تأثير معنوى مقارنة بالكنترول لكل من الموسمين 2001 و 2002 ،

بالترتيب تحت ظروف الرى السطحى والرى بالتنقيط ، فقد أعطى فينوكسابروب-ب-إيثيل بالتركيز الموصى به مع FYM طول نبات 66 ، 66 سم وإنتاج حبوب 13.335 ، 13.335 أردب/فدان وإنتاج قش 3.88 ، 3.865 طن/فدان بالمقارنة بالكنترول 37 ، 37 سم لطول النبات و 10.100 ، 10.025 أردب/فدان لإنتاج الحبوب و 2.565 ، 2.560 طن/فدان لإنتاج القش لكلاً من الموسمين 2001 ، 2002م ، على الترتيب تحت ظروف الرى السطحى والرى بالتنقيط . كما أوضحت النتائج أنه عند إستخدام مسافة 10 سم ومعدل تسميد 15 كجم فو$_2$أ$_5$/فدان أن المعاملة بالمبيد الحشرى بريميكارب كان الأعلى تأثيراً معنوياً فى النمو وإنتاج الحبوب والقش يليه فينيتروثيون بينما كان ثايبريمثرين الأقل تأثيراً فى كل من الموسمين 2001 ، 2002 تحت ظروف الرى السطحى والرى بالتنقيط حيث أعطى بريميكارب إنتاج حبوب 13.565 ، 13.530 أردب/فدان والفينيتروثيون 12.675 ، 12.655 أردب/فدان وأخيراً الثايبريمثرين 11.250 ، 11.240 أردب/فدان بالمقارنة بالكنترول 10.035 ، 10.275 أردب/فدان فى كلاً من الموسمين 2001 ، 2002 على الترتيب تحت ظروف الرى السطحى والرى بالتنقيط أما ملاثيون فقط أعطى تأثيراً معنوياً أعلى فى التركيز 150 سم^3/فدان عن التركيز 75 سم^3/فدان فى زيادة النمو وإنتاج الحبوب والقش بالمقارنة بالكنترول فى كل من الموسمين 2001 ، 2002 تحت ظروف الرى السطحى والرى بالتنقيط ، وقد أظهرت النتائج أيضاً أن التسميد بمعدل 30 كجم فو$_2$أ$_5$ / فدان وعلى مسافة 20 سم بدون المعاملة بالمبيدات الحشرية قد أعطى أعلى تأثير معنوى فى زيادة النمو وإنتاج الحبوب والقش فى كل من الموسمين 2001 ، 2002 تحت تأثير الرى السطحى والرى بالتنقيط ، وفى كل التجارب السابقة قد أظهرت النتائج أيضاً أن النمو وإنتاج الحبوب والقش قد زاد معنوياً فى الرى السطحى عن الرى بالتنقيط فى كل من الموسمين 2001 ، 2002 .

لذلك على مستخدم المبيدات والأسمدة الأخذ فى الإعتبار مشكلة تلوث المنتج الزراعى والتربة بهذه الكيماويات الزراعية وأنه يجب عدم إستخدام معاملات المبيدات فى محصول القمح لأنه يشكل الركن الأساسى فى معظم الوجبات الغذائية ، ومازالت الحاجة ماسة لمزيد من االبحث لبلوغ السبيل الأمثل للعمليات الزراعية للتقليل من الأضرار التى تصيب المحصول من الآفات للحصول على منتج عالى الجودة والكمية وآمن وخالى من التلوث .

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Table (1): Common name, trade mark, formulation, recommended rate, chemical name and the origin of The tested pesticides.

No.	Common name	Trade mark	formulation	Recommended dose	Chemical name	Origin
1- Herbicide						
	Fenoxaprop-p-ethyl	Puma-super (puma-s)	7.5% EW	500 cm^3/Fed. with 200 L. water	(R) -2- [4- (6 - chloro-1,3 –benzoxazol -2- yloxy) phenoxy] propionic acid.	Hoechst AG
2- Insecticides						
1	Pirimicarb	Aphox	50% WG	31.2 g/Fed. with 100 L. water	2-dimethylamino-5-6-dimethylpyrimidin-4-yl.	ICI Agrochemicals
2	Fenitrothion	Sumithion	50% EC	250 cm^3/Fed. with 100 L. water	0,0-dimethyl 0-4-nitro-m-tolyl phosphorothioate.	Sumitomo chemical Co.
3	Cypermethrin	Salabeed	25% EC	50 ml/Fed. with 100 L. water	(RS)-a-cyano -3-phenoxybenzyl (IRS)-cis, trans -3-(2,2, dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate.	Ciba - Geigy
4	Malation	Cythion	57% EC	150 cm^3/Fed. with 100 L. water	Diethyl (dimethoxyphosphinothioylthio) succinate.	American cyanamid Co.

Table (2): Effect of different rates of herbicide fenoxaprop-p-ethyl (cm^3 / Fed.) on plant height (cm), grain yield (ardab / Fed.) and straw yield (ton/Fed.) of wheat plant (*Triticum aestivum* L.) under surface and drip irrigation systems at 2001 and 2002 seasons.

Treatments Rate of Fenoxaprop	Season 2001						Season 2002					
	Plant height (cm)		Yield				Plant height (cm)		Yield			
			Grain ardab/Fed.		Straw ton/Fed.				Grain ardab/Fed.		Straw ton/Fed.	
-p-ethyl cm^3/Fed	Surface Irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation
100	40	37	10.58	9.53	2.69	2.44	41	35	10.53	9.40	2.70	2.43
Mean	38.50 ^{a}		10.055 ^{a}		2.565 ^{a}		38.00 ^{a}		9.965 ^{a}		2.565 ^{a}	
200	41	40	10.65	9.72	2.70	2.46	40	36	10.62	9.51	2.72	2.51
Mean	40.50 ^{a}		10.185 ^{a}		2.58 ^{a}		38.00 ^{a}		10.65 ^{a}		2.6133 ^{a}	
300	57	48	11.92	10.17	3.33	3.21	58	45	11.90	10.08	3.35	3.19
Mean	52.50 ^{b}		11.45 ^{b}		3.27 ^{b}		51.50 ^{b}		10.823 ^{b}		3.327 ^{b}	
400	65	54	12.48	11.88	3.64	3.59	63	55	12.55	12.15	3.65	3.56
Mean	59.50 ^{c}		12.18 ^{c}		3.515 ^{c}		59.00 ^{c}		12.35 ^{c}		3.605 ^{c}	
500	69	58	13.60	12.92	3.88	3.77	68	59	13.40	13.23	3.90	3.74
Mean	63.50 ^{d}		13.26 ^{d}		3.825 ^{d}		63.50 ^{d}		13.315 ^{d}		3.82 ^{d}	
Control	39	36	10.51	9.50	2.67	2.43	37	33	10.42	9.35	2.66	2.42
Mean	37.50 ^{a}		10.005 ^{a}		2.55 ^{a}		35.00 ^{a}		9.885 ^{a}		2.54 ^{a}	
Mean	51.833 ^{b}	45.50 ^{a}	11.62 ^{b}	10.6233 ^{a}	3.1516 ^{b}	2.9833 ^{a}	51.1666 ^{b}	43.833 ^{a}	11.5144 ^{b}	10.62 ^{a}	3.1633 ^{b}	2.9744 ^{a}
L.S.D $_{0.05}$ between rates of pesticides treatments(A)	3.224606		0.159276		0.0810033		4.397086		0.234911		0.0801246	
L.S.D $_{0.05}$ between irrigation systems (B)	2.02185		0.121111		0.039779		1.467594		0.163455		0.033892	
L.S.D $_{0.05}$ between (AB)	4.952933		0.296687		0.079564		3.59516		0.400418		N.S.	

Table (3): Effect of herbicide fenoxaprop-p-ethyl and farmyard manure (FYM) on plant height (cm), grain yield (ardab / Fed.) and straw yield of wheat plant (*Triticum aestivum* L.) under surface and drip irrigation systems at 2001 and 2002 seasons.

Treatments	Season 2001						Season 2002					
	Plant height (cm)		Yield				Plant height (cm)		Yield			
			Grain ardab/Fed.		Straw ton/Fed.				Grain ardab/Fed.		Straw ton/Fed.	
	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation
Fenoxaprop-p-ethyl + FYM	68	64	13.75	12.92	3.96	3.80	67	65	13.60	13.07	3.94	3.79
Mean	66.00 ^{d}		13.335 ^{d}		3.88 ^{d}		66.00 ^{d}		13.335 ^{d}		3.865 ^{d}	
Fenoxaprop-p-ethyl	70	54	12.30	11.85	3.39	3.25	61	55	12.13	11.75	3.35	3.28
Mean	62.00 ^{c}		12.075 ^{c}		3.32 ^{c}		58 ^{c}		11.94 ^{c}		3.315 ^{c}	
FYM	46	41	11.37	9.83	3.20	3.08	44	40	11.40	10.05	3.24	3.03
Mean	43.50 ^{b}		10.60 ^{b}		3.1175 ^{b}		42.00 ^{b}		10.725 ^{b}		3.135 ^{b}	
Control	39	35	10.57	9.63	2.67	2.46	38	36	10.46	9.59	2.65	2.47
Mean	37.00 ^{a}		10.10 ^{a}		2.565 ^{a}		37.00 ^{a}		10.025 ^{a}		2.56 ^{a}	
Mean	55.75 ^{b}	48.50 ^{a}	11.9975 ^{b}	11.0575 ^{a}	3.305 ^{b}	3.13625 ^{a}	52.50 ^{b}	49.00 ^{a}	11.8975 ^{b}	11.115 ^{a}	3.295 ^{b}	3.1425 ^{a}
L.S.D$_{0.05}$ between treatments(A)	3.4963		0.136238		0.0953916		3.7929		0.1776704		0.03262548	
L.S.D$_{0.05}$ between irrigation systems (B)	2.3299		0.070997		0.0497319		2.3535		0.038815		0.05658333	
L.S.D$_{0.05}$ between (AB)	4.65979		0.141989		N.S.		N.S.		0.077629		N.S.	

Table (4): Effect of three insecticides on plant height (cm), grain yield (ardab / Fed.) and straw yield (ton/Fed.) of wheat plant (*Triticum aestivum* L.) under surface and drip irrigation systems at 2001 and 2002 seasons.

Treatments	Season 2001						Season 2002					
	Plant height (cm)		Yield				Plant height (cm)		Yield			
			Grain ardab/Fed.		Straw ton/Fed.				Grain ardab/Fed.		Straw ton/Fed.	
	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation
Pirimicarb	71	65	13.89	13.24	3.98	3.85	70	67	13.95	13.11	3.97	3.86
Mean	68 ^{c}		13.565 ^{d}		3.915 ^{d}		66.833 ^{d}		13.53 ^{d}		3.915 ^{d}	
Fenitrothion	66	55	12.90	12.45	3.66	3.58	67	54	12.80	12.51	3.65	3.59
Mean	60.50 ^{b}		12.675 ^{c}		3.62 ^{c}		60.50 ^{c}		12.655 ^{c}		3.62 ^{c}	
Cypermethrin	63	51	11.47	11.03	3.55	3.48	62	51	11.57	10.91	3.58	3.47
Mean	57 ^{b}		11.25 ^{b}		3.515 ^{b}		56.50 ^{b}		11.24 ^{b}		3.525 ^{b}	
Control	40	38	10.44	9.63	2.68	2.46	40	37	10.65	9.90	2.66	2.47
Mean	39 ^{a}		10.035 ^{a}		2.5883 ^{a}		38.33 ^{a}		10.275 ^{a}		3.565 ^{a}	
Mean	60.00 ^{b}	52.25 ^{a}	12.175 ^{b}	11.5875 ^{a}	3.4675 ^{b}	3.35166 ^{a}	59.75 ^{b}	51.33 ^{a}	12.2425 ^{b}	11.6075 ^{a}	3.465 ^{b}	3.3475 ^{a}
L.S.D$_{0.05}$ between pesticides treatments(A)	4.392341		0.067935		0.029266		3.9152		0.11202027		0.0491924	
L.S.D$_{0.05}$ between irrigation systems (B)	1.596259		0.056288		0.036207		3.0078895		0.055496		0.032098	
L.S.D$_{0.05}$ Between (AB) interaction	3.192512		0.112578		N.S.		N.S.		0.110992		N.S.	

Table (5): Effect of foliar application of insecticide malathion on plant height (cm), grain yield (ardab / Fed.) and straw yield (ton/ Fed.) of wheat plant (*Triticum aestivum* L.) under surface and drip irrigation systems at 2001 and 2002 seasons.

Treatments	Rate of insecticide cm^3/Fed. with 100 L. water	Season 2001						Season 2002					
		Plant height (cm)		Yield				Plant height (cm)		Yield			
				Grain ardab/Fed.		Straw ton/Fed.				Grain ardab/Fed.		Straw ton/Fed.	
		Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation
Malathion	150	68	66	13.60	12.93	3.55	3.48	69	67	13.41	13.08	3.58	3.47
Mean		67.00 c		12.265 c		3.515 c		68.00 c		13.245 c		3.525 c	
Malathion	75	57	56	10.78	9.88	2.96	2.83	55	54	10.17	9.50	2.94	2.86
Mean		56.50 b		10.33 b		2.895 b		54.50 b		9.835 b		2.9 b	
Control		40	38	9.95	8.91	2.60	2.42	41	37	9.13	8.42	2.63	2.43
Mean		39.00 a		9.43 a		2.51 a		39.00 a		8.975 a		2.53 a	
Mean		55.00 a	53.33 a	11.4433b	11.5733a	3.03666b	2.91 a	55.00 a	52.666 a	10.9033b	10.3333a	3.05 b	2.92 a
L.S.D0.05 between pesticides treatments (A)		7.631717		0.104706		0.0805485		4.5102399		0.210025		0.0967333	
L.S.D0.05 between irrigation systems (B)		N.S.		0.032963		0.026638		N.S.		0.078233		0.0436702	
L.S.D0.05 between (AB)		N.S.		0.053807		0.043482		N.S.		0.1277		N.S.	

Table (6): Effect of phosphorus levels (kg P_2O_5 /Fed.), rows spacings (cm) on plant height (cm), grain yield (ardab / Fed.) and straw yield (ton/ Fed.) on wheat plant (*Triticum aestivum* L.) under surface and drip irrigation systems in 2001 and 2002 seasons.

Factors		Season 2001						Season 2002					
Phosphorus levels (super-phosphate) kg P_2O_5 / Fed.	Row spacing (cm)	Plant height (cm)		Yield				Plant height (cm)		Yield			
				Grain ardab/Fed.		Straw ton/Fed.				Grain ardab/Fed.		Straw ton/Fed.	
		Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation	Surface irrigation	Drip irrigation
0	20	39	36	10.43	9.10	2.93	2.59	37	34	9.72	8.90	2.77	2.53
	25	36	33	9.68	8.34	2.76	2.42	33	31	8.90	7.96	2.56	2.31
	30	32	29	7.90	7.13	2.23	2.06	30	27	7.40	6.85	2.11	1.95
Mean		34.1666 a		8.7633 a		2.5033 a		32.00 a		8.2883 a		2.3727 a	
15	20	52	47	11.28	10.65	3.24	3.03	50	46	10.91	10.52	3.15	2.99
	25	45	42	11.10	10.42	3.16	2.92	43	40	10.54	10.33	3.00	2.94
	30	42	39	10.74	9.70	3.06	2.76	40	37	10.11	9.61	2.88	2.71
Mean		44.5000 b		10.6483 b		3.0283 b		42.6666 b		10.3366 b		2.9466 b	
30	20	66	63	13.65	13.20	3.90	3.76	65	62	13.33	13.00	3.79	3.70
	25	63	59	12.79	12.39	3.66	3.55	61	59	12.53	12.21	3.57	3.48
	30	60	56	12.36	12.00	3.53	3.42	57	55	12.21	11.92	3.46	3.39
Mean		61.1666 d		12.7333 d		3.6366 d		59.8333 d		12.5333 d		3.5655 d	
45	20	58	53	12.15	11.82	3.47	3.33	55	52	11.96	11.60	3.41	3.28
	25	55	51	11.90	11.43	3.39	3.22	53	49	11.70	11.23	3.33	3.21
	30	49	44	11.54	11.00	3.29	3.13	47	43	11.22	10.95	3.18	3.12
Mean		51.6666 c		11.6400 c		3.3050 c		49.8333 c		11.4433 c		3.2561 c	
Mean		49.75 b	46.00 a	11.2933b	10.5991a	3.2208 b	3.0158 a	47.5833b	44.5833a	10.8775b	10.42333a	3.1019 b	2.9686 a
L.S.D0.05 between levels fertilizer (A)		0.9849755		0.0876151		0.027272		0.552189		0.0764591		0.019691	
L.S.D0.05 between rows spacings (B)		0.565584		0.054700		0.0175328		0.52256		0.0568679		0.0161427	
L.S.D0.05 between irrigation systems (C)		0.343983		0.05068159		0.013396		0.47622		0.03889189		0.011665	
L.S.D0.05 between AB interaction		1.099406		0.106515		0.03414		1.0175666		0.110736		0.031434	
L.S.D0.05 between AC interaction		0.688		0.10136788		0.026794		N.S.		0.077788		0.023333	
L.S.D0.05 between BC interaction		N.S.		N.S.		N.S.		N.S.		N.S.		N.S.	
L.S.D0.05 between ABC interaction		N.S.		0.175574		0.046408		N.S.		0.134732		0.40411	

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