EFFECT OF AGRICULTURAL PRACTICES AND AGROCHEMICALS ON GROWTH AND YIELD OF WHEAT (Triticum aestivum L.)
Salem, H. A. I.

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 P₂O₅/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 cm³/Fed). Malathion was applied with two rates of 75 and the recommended rate of 150 cm³/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 cm³/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 (P₂O₅), 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 fenitrothion 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 cm³/Fed. followed by the rate 75 cm³/Fed. compared with the control. Application of phosphorus levels especially at rate 30kg P₂O₅/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, nutrition.
Salem, H. A. I.

higher levels of phosphorus in the three growing seasons (phosphorus rates P$_2$O$_5$/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$_2$O$_5$ 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, Bhat 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 lettuce. Also, Salem (1999b) indicated that pirimiphos-methyl and chloropyrifos-methyl significantly increased yield of tomato plant. Moreover, Salem et al. (2002) demonstrated that soil treated with either FYM or aldicarb or both, carbosulfan, chloropyrifos, trazophos, 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 20$_{th}$ November to 20$_{th}$ 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 20th 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 length 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 formulations of the herbicide fenoxaprop-p-ethyl at different rates (100, 200, 300, 400 and 500 cm²/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 cm³/Fed.) and fenoxaprop-p-ethyl (500 cm³/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 uniformly. 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 formulation according to the recommended rates of 31.2 g, 250 cm³ 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 the insecticide malathion was performed at the recommended rate of 150 cm³ and half the recommended rate of 75 cm³/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 P₂O₅ was used in the form of supper phosphate (15% P₂O₅) 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 P₂O₅/Fed.) and three row spacings (20, 25 and 30 cm). Phosphorus fertilizer was used in the form of supper phosphate (15% P₂O₅) and applied before sowing. No insecticides treatments were used in these plots, other normal agricultural practices were followed uniformly. 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 cm³/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 cm²/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 ardad/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 ardad/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 ardad/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 chickepa 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 haloxlyfop-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 cypermthrin 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 ardam/Fed. for finitrothion were 12.675 and 12.655 ardam/Fed. and at the rate of 75 cm

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 cm²/Fed. were 67 and 68 cm and at rate 75 cm²/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 cm²/Fed. were 12.265 and 13.245 ardam/Fed. and at the rate of 75 cm²/Fed. were 10.33 and 9.835 ardam/Fed. compared with control 9.430 and 8.975 ardam/ 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 cm²/Fed. were 3.515 and 3.525 ton/Fed. and at rate of 75 cm²/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 ar dab/Fed. for drip irrigation system, for the 2001 season and 10.903 for surface irrigation compared with 10.333 ar dab/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. Han yat 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 P₂O₅/Fed. with 20 cm spacing compared with 0, 15 and 45 kg P₂O₅/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 P₂O₅ 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 P₂O₅/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 heavier bolls were detected at higher phosphorus level, i.e. 30 kg P₂O₅/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: Girgis 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 combination 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 limiting 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 nematodes population densities and increase pods and haulms yield in peanut. Incidence of peanut clump 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 EI-Sherief, 1998; Salem and EI-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 consequently the manual elimination 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). In 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 P₂O₅ 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 P₂O₅ 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 support 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.

REFERENCES


Salem, H. A. I.


لذلك على مستخدم المبيدات الأسلحة الأخرى في الاعتبار مشكلة تلوث المنتج الزراعي والقنبية بهذا الكيماويات الزراعية وأنه يجب عدم استخدام معاملات المبيدات في محصول القنب لأنه يشكل الركن الأساسي في معظم الوجبات الغذائية، ونوات الحاجة ماسة لزيادة من البحث لبعل القنب.

الأمثلة للعمليات الزراعية للتقليل من الأضرار التي تصبح المحصول عن الآفات للحصول على منتج عالي الجودة والكلبية وأهم وجاهلاً من التثو.
No. | Common name | Trade mark | formulation | Recommended dose | Chemical name | Origin
--- | --- | --- | --- | --- | --- | ---
1 | Triticum aestivum | Puma-super (puma-s) | 7.5% EW | 500 cm²/Fed. with 200 L water | (R)-2-[4-(6-chloro-1,3-benzoazol -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 cm²/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 phenoxybenzyl (IRS)-cis, trans dichlorovinyl)-2,2,3-dimethylcyclopropane-carboxylate. | Ciba - Geigy

4 | Malation | Cythion | 57% EC | 150 cm²/Fed. with 100 L water | Ethyl (dimethoxyphosphinithio ylthio) succinate. | American cyanamid Co.

---

Table (2): Effect of different rates of herbicide fenoxaprop-p-ethyl (cm²/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.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Rate of Fenoxaprop cm²/Fed</th>
<th>Season 2001</th>
<th>Season 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plant height (cm)</td>
<td>Grain yield (ardab/Fed.)</td>
<td>Straw yield (ton/Fed.)</td>
</tr>
<tr>
<td>100</td>
<td>Surface Irrigation 40</td>
<td>Drip Irrigation 37</td>
<td>Surface Irrigation 10.58</td>
</tr>
<tr>
<td>200</td>
<td>Mean 38.50 a</td>
<td>10.055 a</td>
<td>2.565 a</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>41</td>
<td>40</td>
</tr>
<tr>
<td>Mean</td>
<td>40.50 a</td>
<td>10.18 a</td>
<td>2.58 a</td>
</tr>
<tr>
<td>300</td>
<td>Mean 52.50 b</td>
<td>11.45 b</td>
<td>3.27 b</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>57</td>
<td>48</td>
</tr>
<tr>
<td>Mean</td>
<td>59.50 c</td>
<td>12.18 c</td>
<td>3.515 c</td>
</tr>
<tr>
<td>400</td>
<td>Mean 63.50 d</td>
<td>13.26 d</td>
<td>3.825 d</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>65</td>
<td>54</td>
</tr>
<tr>
<td>Mean</td>
<td>69</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>Control</td>
<td>Mean 37.50 a</td>
<td>10.005 a</td>
<td>2.55 a</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>36</td>
<td>10.51</td>
</tr>
<tr>
<td>L.S.D as between rates of pesticides treatments(A)</td>
<td>3.224606</td>
<td>0.159276</td>
<td>0.0810033</td>
</tr>
<tr>
<td>L.S.D as between irrigation systems (B)</td>
<td>2.02185</td>
<td>0.121111</td>
<td>0.039779</td>
</tr>
</tbody>
</table>
| L.S.D as 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.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surface irrigation</td>
<td>Drip irrigation</td>
<td>Surface irrigation</td>
<td>Drip irrigation</td>
<td>Surface irrigation</td>
<td>Drip irrigation</td>
</tr>
<tr>
<td>Triticum aestivum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fenoxaprop-p-ethyl + FYM</td>
<td>68</td>
<td>64</td>
<td>13.75</td>
<td>12.92</td>
<td>3.96</td>
<td>3.80</td>
</tr>
<tr>
<td>Mean</td>
<td>66.00</td>
<td>d</td>
<td>13.335</td>
<td>3.88</td>
<td>d</td>
<td>13.335</td>
</tr>
<tr>
<td>Fenoxaprop-p-ethyl</td>
<td>70</td>
<td>54</td>
<td>12.30</td>
<td>11.85</td>
<td>3.39</td>
<td>3.25</td>
</tr>
<tr>
<td>Mean</td>
<td>62.00</td>
<td>c</td>
<td>12.075</td>
<td>3.32</td>
<td>c</td>
<td>11.94</td>
</tr>
<tr>
<td>FYM</td>
<td>46</td>
<td>41</td>
<td>11.37</td>
<td>9.83</td>
<td>3.20</td>
<td>3.08</td>
</tr>
<tr>
<td>Mean</td>
<td>43.50</td>
<td>b</td>
<td>10.60</td>
<td>3.1175</td>
<td>b</td>
<td>10.725</td>
</tr>
<tr>
<td>Control</td>
<td>39</td>
<td>35</td>
<td>10.57</td>
<td>9.63</td>
<td>2.67</td>
<td>2.46</td>
</tr>
<tr>
<td>Mean</td>
<td>37.00</td>
<td>a</td>
<td>10.10</td>
<td>2.565</td>
<td>a</td>
<td>10.025</td>
</tr>
<tr>
<td>L.S.Dₐₐ between treatments(A)</td>
<td>3.4963</td>
<td></td>
<td>0.136238</td>
<td>0.0953916</td>
<td></td>
<td>3.7929</td>
</tr>
<tr>
<td>L.S.Dₐₐ between irrigation systems (B)</td>
<td>2.3299</td>
<td></td>
<td>0.070997</td>
<td>0.0497319</td>
<td></td>
<td>2.3535</td>
</tr>
<tr>
<td>L.S.Dₐₐ between (AB)</td>
<td>4.65979</td>
<td></td>
<td>0.141989</td>
<td>N.S.</td>
<td></td>
<td>N.S.</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surface irrigation</td>
<td>Drip irrigation</td>
<td>Surface irrigation</td>
<td>Drip irrigation</td>
<td>Surface irrigation</td>
<td>Drip irrigation</td>
</tr>
<tr>
<td>Phenolic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>68</td>
<td>c</td>
<td>13.565</td>
<td>3.915</td>
<td>d</td>
<td>13.53</td>
</tr>
<tr>
<td>Fenitrothion</td>
<td>66</td>
<td>55</td>
<td>12.90</td>
<td>12.45</td>
<td>3.66</td>
<td>3.58</td>
</tr>
<tr>
<td>Mean</td>
<td>60.50</td>
<td>b</td>
<td>12.675</td>
<td>3.62</td>
<td>c</td>
<td>12.665</td>
</tr>
<tr>
<td>Cypermethrin</td>
<td>63</td>
<td>51</td>
<td>11.47</td>
<td>11.03</td>
<td>3.55</td>
<td>3.48</td>
</tr>
<tr>
<td>Mean</td>
<td>57</td>
<td>57</td>
<td>11.25</td>
<td>3.515</td>
<td>b</td>
<td>11.24</td>
</tr>
<tr>
<td>Control</td>
<td>40</td>
<td>38</td>
<td>10.44</td>
<td>9.63</td>
<td>2.68</td>
<td>2.46</td>
</tr>
<tr>
<td>Mean</td>
<td>39</td>
<td>39</td>
<td>10.035</td>
<td>2.5883</td>
<td>a</td>
<td>10.275</td>
</tr>
<tr>
<td>L.S.Dₐₐ between pesticides treatments(A)</td>
<td>4.392341</td>
<td></td>
<td>0.067935</td>
<td>0.029266</td>
<td></td>
<td>3.9152</td>
</tr>
<tr>
<td>L.S.Dₐₐ between irrigation systems (B)</td>
<td>1.596259</td>
<td></td>
<td>0.056288</td>
<td>0.036207</td>
<td></td>
<td>0.0578895</td>
</tr>
<tr>
<td>L.S.Dₐₐ Between (AB) interaction</td>
<td>3.192512</td>
<td></td>
<td>0.112578</td>
<td>N.S.</td>
<td></td>
<td>0.110992</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Rate of insecticide cm²/Fed. with 100 L water</th>
<th>Season 2001</th>
<th>Season 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Plant height</td>
<td>Grain yield</td>
</tr>
<tr>
<td>Malathion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15.0 c</td>
<td>12.265 c</td>
<td>3.515 c</td>
</tr>
<tr>
<td>Malathion</td>
<td>75</td>
<td>10.78 b</td>
<td>2.96 b</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td>9.95 a</td>
<td>2.60 a</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>9.43 a</td>
<td>2.51 a</td>
</tr>
<tr>
<td>L.S.D.</td>
<td>5.00 a</td>
<td>3.33 a</td>
<td>2.91 a</td>
</tr>
</tbody>
</table>

Table (6): Effect of phosphorus levels (kg P₂O₅ / Fed.), row 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.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Season 2001</th>
<th>Season 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphorus levels &amp; Row spacing</td>
<td>Plant height (cm)</td>
<td>Grain yield</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>34.166 a</td>
<td>8.763 a</td>
</tr>
<tr>
<td>15</td>
<td>35</td>
<td>42</td>
</tr>
<tr>
<td>Mean</td>
<td>35</td>
<td>42</td>
</tr>
<tr>
<td>15</td>
<td>44.5000</td>
<td>10.0584</td>
</tr>
<tr>
<td>Mean</td>
<td>44.5000</td>
<td>10.0584</td>
</tr>
<tr>
<td>15</td>
<td>61.166 a</td>
<td>12.733 b</td>
</tr>
<tr>
<td>Mean</td>
<td>61.166 a</td>
<td>12.733 b</td>
</tr>
<tr>
<td>45</td>
<td>59</td>
<td>55</td>
</tr>
<tr>
<td>Mean</td>
<td>59</td>
<td>55</td>
</tr>
</tbody>
</table>