INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print) 2222-5234 (Online)
http://www.innspub.net
Vol. 23, No. 1, p. 141-149, 2023

RESEARCH PAPER OPEN ACCESS

Performance of hot pepper (*Capsicum annuum*) as influenced by application of farm manures and foliar fertilizers

Boyet C. Pattung[1], Joyce C. Pattung[1], Angelina T. Gonzales[*2]

[1,2]*College of Agriculture, Cagayan State University-Lal-lo Campus, Cagayan, Phillippens*

[2]*Don Mariano Marcos Memorial State University, Bacnotan, La Union, Phillippens*

Key words: Hot pepper, Farm manures, Foliar fertilizers, Organic fertilizers

http://dx.doi.org/10.12692/ijb/23.1.141-149 Article published on July 10, 2023

Abstract

This study aimed to determine the best combination of farm manures and foliar fertilizers that could give higher yield for hot pepper. It was conducted at Cagayan State University Lal-lo from January-May 2019. The treatments were : T1(Chicken manure +Yield Master (foliar1); T2 (Chicken manure+ Malago (foliar2); T3 (Chicken manure+ No Foliar; T4 (Goat manure+ Yield Master (foliar1); T5 (Goat manure+ Malago (foliar2); T6 (Goat manure+ No Foliar; T7 (Balanced Fertilization+ Yield Master (foliar1); T8 (Balanced Fertilization + Malago (foliar2); and T9 (Balanced Fertilization + No Foliar). Result shows that the okra plants that received Chicken manure+ No Foliar fertilizer (T3) had the tallest plant height at 90 days after transplanting but no significant differences among other treatments. Highest number of marketable fruits means was attained by okra plants that received Goat manure+ Yield Master (foliar1) fertilizer (T4) with significant difference among other treatments. In terms of weight of fruits at 1st and 2nd harvest, okra plants that received Goat manure+ Yield Master (foliar1) (T4) and Goat manure+ No Foliar fertilizer (T6) obtained the highest weight of fruits with a mean of 425.33 g and 1052 g respectively.

* **Corresponding Author:** Angelina T. Gonzales ✉ agonzales@dmmmsu.edu.ph

Introduction

Capsicum annuum is species of the plant under genus *Capsicum* (peppers) and native to North America and South America. These species is the most commonly and extensively cultivated of the five domesticated *Capsicums*. The species encompasses a wide variety of shapes and sizes of peppers, both mild and hot, such as bell peppers, jalapenos, New Mexico Chile, and cayenne peppers. Hot peppers are used in medicine as well as food in Africa and other places around the world.

In 2018 consumers got alarm over the price hike of red chilli pepper or *siling labuyo* from around P150 per kilo in February to about P1000 per kilo in the earlier week of that month, sparking price comparisons between public markets and groceries in Metro Manila. Such reports circulated on social media over the weekend, and later caused anxiety on possible cost-cutting measures that would lessen the use of spice staple in many Filipino cuisines (Madarang, RC, 2018).

Nowadays, hot pepper considered as one of the most consumable high value commercial crops, and can be produced organically thus help maintain the original structure of the soil through applying farm manure and organic fertilizer thus more environmentally friendly and contributes for a healthier lifestyle.

Organic food may be much more or much less likely to contain antibiotics, depending on their treatment of manure. The non-usage of artificial fertilizers and resulting exclusive used of manure as fertilizer, by organic farmers can result in significantly greater accumulation of antibiotics and organic foods.

Foliar fertilizer, although not a substitute for a healthy soil, can be beneficial when a plant is suffering from a certain deficiencies (Lovatt CJ. 1999,

Foliar plants spray involve applying fertilizer directly to a plant leaves as opposed to putting it in the soil. Organic fertilizers can be used to reduce the amount of toxic compound (such as nitrates) produced by conventional fertilizers, vegetable like lettuce. Hence, improving the quality of leafy vegetables as well as human health (Masarirambi *et al.*, 2010). With continuing consumer concerns related to the environment and the chemicals used in food production, growing of organic production of plants is bright (Dimitri and Greene, 2002). Farm income will also improve when farmers use less money on fertilizers and pesticides for growing crops (Masarirambi *et al.*, 2010), thus this study.

The study aimed to determine which treatment combination of composted farm manures and foliar fertilizers can give higher yield in hot pepper. Specifically, it aimed to determine which treatment combination can give the best performance in terms of the following parameters: (a) plant height, (b) average length of fruit, (c) average number of fruit, (d) number of days from transplanting to flowering, (e) number of days from fruiting to harvesting, (f) average number of flowers, (g) marketable and non-marketable fruits, (h) average number of seeds per fruit, and (i) total yield per hectare.

Materials and methods

Experimental design

The Factorial Randomized Complete Block Design was used in the study with a total land area of 553.6 square meters. The area is divided into three (3) blocks to represent the three replication. Each block has a dimension of 3.6 meters by 4 meters and a distance of 1 meter between plot and blocks. The experimental treatments used were: T1 (Chicken manure +Yield Master (foliar1); T2(Chicken manure+ Malago (foliar2); T3 (Chicken manure+ No Foliar); T4 (Goat manure+ Yield Master (foliar1); T5 (Goat manure+ Malago (foliar2); T6 (Goat manure+ No Foliar; T7 (Balanced Fertilization+ Yield Master (foliar1); T8 (Balanced Fertilization + Malago (foliar2); and T9 (Balanced Fertilization + No Foliar).

Land Preparation

A total land area of 565.6 square meter was thoroughly prepared by alternate plowing and harrowing to attain good soil tilt and to prevent the growth of weeds. After the last harrowing, the field were levelled and plots was made by the following design.

Farm Manure Decomposition

Animal manures were collected at the nearby farms in the locality and were subjected for decomposition. These manure was shredded in to small pieces then placed in a warm safe place. The right amount of moisture content was maintained to allow aeration for faster decomposition. These were set in a safe place for several days until fully decomposed before applying in your garden.

Plastic mulch Installation

The plastic mulch was installed two (2) weeks before transplanting to maintain the moisture content of the soil.

Seed Sowing

The hot pepper seeds were sown in the seedling tray to promote higher survival rate and faster recovery of the transplanted seedling.

Transplanting

Thirty (30) days after seed sowing (DAS), the seedlings were transplanted in the experimental area with a distance of 50 centimeters between rows and 45 centimeter between hills.

Watering the Plants

The plants were watered depending on soil moisture and weather condition.

Weeding

Weeding was done as the need arose at the spaces between plots.

Fertilizer Application

Composted manures were applied at the rate of 10.8 kgs per treatment and 1.21 kg for in-organic fertilizer per treatment.

Foliar Application

Each organic foliar fertilizer was sprayed following the manufacturers' recommendation with 14 days interval when the plant start to bear flower.

Controlling Insect Pest and Diseases

Due to the occurrence of stem rot, the recommended rate of fungicide (Kocide) was applied on the plants in order to prevent the occurrence of insect pest and diseases. Fungicide was sprayed following the manufacturers recommendation.

Harvesting

Harvesting was done when the fruits have attained full size and appear waxy, shiny and red in color. The interval of harvesting was 9 days after the first harvesting.

Gathering Data

From the sample plants per treatment, the following agronomic and yield data for each variety were gathered for data analysis.

a. Plant height (cm)

This was taken by measuring the sample plants from the base up to the tip of the plant using a meter stick.

b. Average length of fruit (cm)

This was taken by measuring the vegetable fruit from the calyx up to the apex part of the fruit using foot rule.

c. Average number of fruit

This was done by counting all the developed fruit per sample plant.

d. Number of days from transplanting to flowering

This was taken by counting the days from transplanting to flowering.

e. Number of days from fruiting to harvesting

This was taken by counting the days from flowering to harvesting

f. Average number of flowers

This was taken by counting all the flowers of the sample plants

g. Average number of primary branch

This was taken by counting the primary branch connected on the trunk of the plant and its branches

i. Marketable and non-marketable fruits

This was taken by grading the hot pepper fruit by its quality for marketing.

j. Average number of seeds per fruit

This was taken by counting the seeds of the fruit in every sample plant.

k. Total yield per hectare (kg)

This was taken by consolidating all the weight of the harvested fruit per treatment.

Result and discussion

Hot Pepper Plant Height at 30, 60, 90 DAT

Table 1 shows the plant height at 30,60,90 days after transplanting (DAT). It shows that hot pepper plants sprayed with goat manure + foliar 1 (T4) is the tallest among the treatments. This were followed by hot pepper plants sprayed with goat manure+ no foliar (T6); then plants that received goat manure+ malago (foliar2) (T5); with balanced fertilization + no foliar) (T9), then followed with hot pepper plants sprayed with chicken manure +yield master (foliar) (T1); sprayed with chicken manure+ malago (foliar2) (T2); then with balanced fertilization+ yield master (foliar1) (T7); balanced fertilization + malago (foliar2) (T8); and with chicken manure+ no foliar (T3) with means of 26.7, 24.17, 24.07, 23.6, 22.37, 22.2, 21.8, and 21.17, respectively. Statistical analysis showed no significant differences on the organic fertilizer tested (A), but goat manure gain the tallest height at 30 DAT. Furthermore, replication, and treatment shows insignificant differences.

Still, at 60DAT, the response of hot peppers to organic fertilizers shows that goat manure + goliar 1 (T4) outperformed other treatments. Then followed by plants received T6, T3, T9, T1, T2, T5, T7, and T8 with a mean of 39.07cm, 38.83cm, 37.77cm, 36.77cm, 36.5cm, 36.17cm, 34.03cm, and 31.4cm, respectively.

The plant height at 90 DAT shows that plants that received chicken manure + no foliar (T3) gave the tallest among the treatments. Then this was followed by plants treated with T6, T2, T4, T9, T5, T1, T7 and T8 with a mean of 42.83cm, 42.8cm, 41.77cm, 41.37cm, 40.73cm, 40.07cm, 38.3cm, 34.53cm, and 34.53cm, respectively.

Statistical analysis, Table 1 showed slight significant differences on the Fertilizer tested (A). Goat manure gain the tallest height at 30, 60, and 90 DAT. The results revealed insignificant differences on foliar fertilizer (B). This means that the combined use of organic fertilizer (A) and foliar fertilizer (B) does not affect plant height at 30, 60 and 90 DAT. Furthermore, replication, and treatment and the interaction fertilizer (A) and foliar fertilizer (B) show insignificant differences. This implied that all the organic fertilizer combinations recommended for chilli pepper production.

Table 1. Plant Height at 30, 60, 90 DAT of Hot Pepper (*Capsicum anuum*) Plants Using Composted Farm Manures and Organic Commercial Foliar Fertilizers.

Treatment	Plant height (cm)		
	30 DAT	60 DAT	90 DAT
T1- Chicken Manure + Foliar 1	23.6	36.77	40.07
T2- Chicken Manure + Foliar 2	22.37	36.5	42.8
T3- Chicken Manure + No Foliar	21.17	38.83	48.33
T4- Goat Manure + Foliar1	27.3	39.5	41.77
T5- Goat Manure + Foliar2	24.17	36.17	40.73
T6- Goat Manure + No Foliar Fertilizer	26.7	39.07	42.83
T7- Balanced Fertilization + Foliar 1	22.2	34.03	38.3
T8- Balanced Fertilization + Foliar 2	21.8	31.4	34.53
T9- Balanced Fertilization + No Foliar	24.07	37.77	41.37
Level of significance	ns	ns	ns

DAT-Days after transplanting

Table 2 shows the number of days from transplanting to flowering, average number of flowers, average number of fruits, average length (cm) of fruits , and average number of seeds per fruit of hot pepper *(Capsicum anuum)* using composted farm manures and organic commercial foliar fertilizers. It shows that plants received goat manure + foliar 1(T3) and plants received Goat Manure + No Foliar (T6) are the shortest number of days from transplanting to flowering among the treatments. This were followed by plants received fertilizers in T5, T9, T7, T1, T3, T8, and T2 with a mean of 43cm, 43cm, 43.33cm, 43.67cm, 43.67cm, 44cm, and 44.33cm, respectively. However, results revealed no significant differences on replication, treatment and the interaction Organic Fertilizer (A) and foliar fertilizer (B) shows

insignificant differences. This means that the different treatments tested produced almost the same number of days from transplanting to flowering.

The same table shows the average number of flowers. It shows that plants fertilized with goat manure + no foliar (T6) has the largest number of flowers among the treatments. This was followed by plants received fertilizers from T4, T3, T2, T9, T8, T5, T1 and T7 with a mean of 115.4cm, 112.97cm, 100.97cm, 98.97cm, 97.1cm, 94.8cm, 88.1cm, and 86.29cm, respectively. Statistical analysis, however, results revealed no significant differences on replication, Treatment and the Interaction organic fertilizer (A) and Foliar fertilizer (B) shows insignificant differences. This means that the different treatments tested produced almost the same number of flowers. The same table shows the average number of fruits of chilli pepper. It shows that plants received chicken manure + foliar 2 (T2) has the largest number among the treatments. This was followed by plants received foliar fertilizers in T3, T8, T9, T6, T4, T1, T7 and T5 with a mean of 49cm, 48 cm, 47cm, 46, 43cm, 42, 41cm, and 40cm, respectively. Statistical analysis revealed no significant differences on replication, treatments and the interaction organic fertilizer (factor A) and foliar fertilizer (factor B) show insignificant differences. This means that the different treatments tested produced almost the same number of fruits.

Table 2. Number of Days from transplanting to flowering, average number of flowers, average number of Fruits, Average Length (cm) of Fruits , and Average number of Seeds per Fruit of Hot Pepper *(Capsicum anuum)* Using Composted Farm Manures and Organic Commercial Foliar Fertilizers.

Treatment	Number of Days from transplanting to flowering	Average number of flowers	average number of Fruits	Average Length (cm) of Fruits	Average number of Seeds per Fruit
T1- Chicken Manure + Foliar 1	43.67	88.1	42	6.19	75.03
T2- Chicken Manure + Foliar 2	44.33	100.97	51	5.97	62.87
T3- Chicken Manure + No Foliar	43.67	112.97	49	6.38	67.93
T4- Goat Manure + Foliar 1	42.67	115.4	43	6.29	70.87
T5- Goat Manure + Foliar 2	43	94.8	40	6.21	65.5
T6- Goat Manure + No Foliar	42.67	186.8	46	6.43	62.3
T7-Balanced Fertilization + Foliar 1	43.33	86.29	41	6.02	66.4
T8- Balanced Fertilization + Foliar 2	44	97.1	48	6.09	67.1
T9-Balanced Fertilization + No Foliar	43	98.97	47	6.15	69.43
Level of significance	ns	ns	ns	ns	ns

For the average length of fruit, the results show that chilli pepper plants fertilized with Goat Manure + No Foliar (T6) has the longest length of fruit harvested among the treatments. This was followed by the hot pepper plants that fertilized with organic fertilizers from T3, T4, T5, T1, T9, T8, T7 and T2 with a mean of 6.38cm, 6.29cm, 6.21cm, 6.19cm, 6.15cm, 6.09cm, 6.02cm, and 5.97cm, respectively. Statistical analysis however, revealed no significant differences on replication, treatment and the interaction of organic fertilizer (factor A) and foliar fertilizer (factor B). This means that the different treatments tested produced almost the same length hot pepper fruits. The same trend was observed in number of seeds per fruit. It shows that hot pepper plants fertilized with chicken manure + foliar 1 (T1) has the largest number of seeds among the treatments. This was followed by plants fertilized with fertilizers from T4, T9, T3, T8, T7, T5, T2, and T6 with a mean of 75.03cm, 70.87cm, 69.43cm, 67.93cm, and 5.97cm, respectively. Statistical analysis revealed no significant differences on replication, treatments and the interaction organic fertilizer (factor A) and foliar fertilizer (factor B) show insignificant differences. This means that the different treatments tested produced almost the same number of fruits. Furthermore, replication treatment and interaction organic fertilizer (A) and foliar fertilizer (B) show insignificant differences.

Marketable and Non-marketable Fruits

The number of marketable and non-marketable fruits at first and second harvesting of hot pepper applied

with different composted farm manures and organic commercial foliar fertilizers is presented in table 3.

The number of marketable at first harvesting shows that plants received goat manure + foliar 1 (T4) has the most number of marketable fruits among the treatments. This was followed by plants applied with T6, T9, T7, T8 T5, T1, T2, and T2 with a mean of 75.03cm, 70.87cm, 69.43cm, 67.93cm, and 5.97cm, respectively. While the non-marketable fruits at first harvesting shows that T3- chicken manure + no foliar has the most number of non-marketable fruits among treatments. This was followed by applkied with composted fertilizers in T5, T6, T7, T9, T1, T2, T4, and T8 with a mean of 7.0, 7.0, 7.0, 6.0, 5.0, 4.0, 4.0, and 2.0, respectively. Statistical analysis in table 3 showed no significant differences on the foliar fertilizer tested (B) and organic fertilizer (A). It means that replication, Treatment, and interaction in organic fertilizer (A) and foliar fertilizer (B) shows insignificant differences.

Table 3. Number of Marketable, Non-marketable Fruits and Fruit Weight (g) at 1st and 2nd Harvesting of Hot Pepper *(Capsicum anuum)* Using Composted Farm Manures and Organic Commercial Foliar Fertilizers.

Treatment	1st Harvesting			2ND Harvesting		
	No. of Marketable Fruits	No. of Non-marketable Fruits	Weight (g) of Fruits	No. of Marketable Fruits	No. of Non-Marketable Fruits	Weight (g) of Fruits
T1- Chicken Manure + Foliar 1	99.33	5	255	384	12	835
T2- Chicken Manure + Foliar 2	78.67	4	126	406	8	911.67
T3- Chicken Manure + No Foliar	91.67	8	231.67	328	9	906.67
T4- Goat Manure + Foliar 1	186.3	4	425.33	480	16	1004
T5- Goat Manure + Foliar 2	107.7	7	317.33	462	11	969
T6- Goat Manure + No Foliar	174.7	7	382.33	494	7	1052.7
T7- Balanced Fertilization + Foliar 1	114.7	7	326.67	346	12	742.67
T8- Balanced Fertilization+ Foliar 2	109.3	2	277.33	334	14	704.33
T9- Balanced Fertilization + No Foliar	138	6	336.67	384	12	478.33

Statistical Inference: Not Significant

On the other hand, the number of marketable fruit at second harvesting, as shown in table 3, revealed that hot pepper plants that received goat manure + no foliar 1 (T6) have the most number of marketable fruits among the treatments. This was followed by hot pepper that received with T4, T5, T2, T1, T9, T7, T8 and T3 with the means of 494, 480, 462, 406, 384, 384, 346, 334, and 328, respectively. While in non-marketable fruits of hot pepper plants at second harvesting show that plants that received goat manure + foliar 1 (T4) has the most number of non-marketable fruits among treatments. This was followed by plants received with T8, T1, T7, T9, T5, T3, T2, and T6 with the means of 14, 12, 12, 12, 11, 9, 8, and 7, respectively. Statistical analysis showed slight significant differences on the organic fertilizer tested (factor A). Plants that received goat manure had the most number of marketable fruit. However, results revealed insignificant differences on foliar fertilizer (factor B). This means that the combined use of organic fertilizer (factor A) and Foliar fertilizer (factor B) does not affect the number of marketable and non- marketable each treatment. Furthermore, replication, treatment and interaction in organic fertilizer (A) and foliar fertilizer (B) shows insignificant differences.

Fruit Weight (g) of Hot Pepper

On the weight (g) of fruits at first harvesting, hot pepper that received goat manure + foliar 1 (T4) has the highest weight of fruits among the treatments. This was followed by plants fertilized with T6, T9, T7, T5, T8, T1, T3 and T2 with recorded mean of 382.33g, 336.67g, 326.67g, 317.33g, 277.33g, 255, 231.67g and 126g, respectively. The results revealed insignificant differences on foliar fertilizer (B). This means that the combined use of organic fertilizer (A) and foliar fertilizer (B) does not affect the number of seeds each treatment. Furthermore, replication treatment and Interaction in organic fertilizer (A) and foliar fertilizer (B) show insignificant differences.

The weight (g) of fruits pf hot pepper plants at second harvesting shows that plants received with goat manure + No Foliar (T6) have the most number of marketable fruits among the treatments. This was followed by plants that were fertilized with T4, T5, T2, T3, T1, T7, T8, and T9 with a mean of 1004, 969, 911.67, 906.67, 835, 742.67, 704.33 and 478.33, respectively. Statistical analysis showed no significant differences on the foliar fertilizer tested (B) and fertilizer (A). It means that replication, treatment, and interaction in organic fertilizer (A) and foliar fertilizer (B) show insignificant differences in the weight (g) of fruits at second harvesting.

The results of the study corroborates with the results of many authors. According to (Tukey HB, Marczynski S., 1984), and (Doring HW, Gericke R., 1986), application of combined foliar and soil fertilizer should be recommended to increase both productivity and yield quality of plants. McCall W. in 1980 and Lovatt CJ., (1999) and Kuepper G. (2003) even stressed out that application of foliar fertilizers is becoming more current and prevalent as practice in crop production, since it is more purposefully, and potentially more environment friendly in contrast to soil fertilization. As pointed out by Wojcik P., (2004), knowledge on mechanism of nutrient absorption by above-ground parts of the plant is crucial to optimize foliar fertilization. Other primary factors influencing relevant for successful application of foliar fertilizer are environmental conditions, qualities and properties of the solutions together with some biological characteristics related to specific botanical varieties and species, size, structure, leaf morphology, nutrient balance of plants and phase of development (Fernández V, Eichert T.and Wojcik P., 2004). Thus, there are many advantages of using foliar fertilization. It can be applied throughout the growing season, which enables to spray with small quantity and composition of the nutrient solution, appropriate to the specific requirements in different phases of the crop development (Kerin V, Berova M, 2003; Kannan S. 2010.; Fernández V, Eichert T, 2009; McCall W.1980; Lovatt CJ.1999; Kuepper G. ; and Taiz L, Zeiger E., 1988). Most of the times, foliar applications facilitate to the rapid absorption of mineral elements, avoiding the occurrence of soil interactions that may limit root uptake due to: example, immobilization of nutrient in the soil. Further, foliar fertilization may also stimulate the capability of the root system to absorb nutrients from the soil solution (Kerin V, Berova M, 2003; Kannan S. 2010., McCall W, 1980; Lovatt CJ, 1999, Wojcik P., 2004).

The conducted study on chilli or hot pepper, corroborates with the current interest in foliar fertilization can be illustrated by several research studies carried out with vegetable crops such as: pepper (Baloch QB,*et al.*, 2008; Maheswari TU, Haripriya K., 2006; Karakurt Y, Unlu H, Padem H.; 2009 and Hussein MM, El-Faham SY, Alva AK., 2012); lettuce (Dimitrov I, 2012); head cabbage (Atanasova E, *et al.*, 2007; melons (Kosterna E, *et al.*, 2009; tomato (Premsekhar M, Rajashree V., 2009 and Ejaz M,*et al.*, 2012); green beans (Fawzy ZF, *et al.*, 2010; Borowski E., *et al.*, 2010; carrots(Smoleń S, Włodzimierz S.*et al.*, 2009; Poberezny J., *et al* 2012; Onion (Charbaji T. *et al* 2008), eggplant (Azarpour E., *et al.*, 2012; Peas (Gad El-Hak SH. *Et al.*, 2012; okra (Mondal MMA, *et al.*, 2012; Cucumber (El-Nemr MA., *et al.*, 2012).

Conclusion

This study was conducted to determine the effect of farm manure and foliar fertilizer. Specifically, to determine the effect of farm manure and commercial foliar fertilizer on plant height, days from transplanting to flowering, days from fruiting to harvesting, numbers of flowers, number of seeds, length of fruit, marketable and non- marketable fruits, weight of fruits. Two factors were used in the study, *i.e.*. Factor A (Farm manure) A1- Chicken manure A2- Goat manure A3- Balance fertilization Factor B (Commercial foliar fertilizer) A1- Foliar 1, A2- Foliar 2, A3- No foliar. The different treatments were laid out following the Randomized Complete Block Design.

The result of the study are summarized as follows: plants that received goat manure was slightly show significance to the other factor A at 30 to 60 DAT, while Factor B had no significant differences among the other Factor B at 90 DAT.

Plants fertilized with chicken manure gained the tallest height among the other Factor B. The interaction between the two factor and Factor A and Factor B show that there is no significant differences in height at 30,60 to 90 DAT. In addition, between the days after transplanting 30-50 days, it was observe that T7, T8, and T9 have observed that most plants were attacked by diseases like stem rot. Balance fertilization significantly influenced the percentage of disease at 30 to 50 DAT. The interaction of farm manure (Factor A) and Commercial foliar fertilizer (Factor B) did not influence the quality of fruits (Marketable and Non-marketable) and the total weight.

Based on the result of the study, it is concluded that the different organic manure affect the growth of the crop as it show on the result of the study.

References

Atanasova E, Mitova I, Dimitrov I, Stancheva I. 2007. Effect of different fertilizer sources on the quality of head cabbage. Journal of Applied Horticulture **9(1),** 74-76.

Azarpour E, Motamed MK, Moraditochaee M, Bozorgi HR. 2012. Effects of bio, mineral nitrogen fertilizer management, under humic acid foliar spraying on fruit yield andseveral traits of eggplant (*Solanum melongena* L.), African Journal of Agricultural Research **7(7),** 1104-1109.

Baloch QB, Chachar QI, Tareen MN. 2008. Effect of foliar application of macro and micro nutrients on production of green chilies (*Capsicum annum* L.), Journal of Agricultural Technology **4(2),** 177-184.

Borowski E, Michalek S. 2011. The effect of foliar fertilization of french bean with iron salts and urea on some physiological processes in plants relative to iron uptake and translocation in leaves, Acta Sci. Pol., Hortorum Cultus **10(2),** 183-193.

Carolyn Dimitri And Catherine Greene. 2002. Organic Agriculture: Gaining Ground. Available at: www.ers. usda. gov/ Publications/Aib777/

Charbaji T, Arabi MIE, Jawhar M. 2008. Urea foliar fertilization affects onion weight and nutrient content, International Journal of vegetable Science **14(3),** 198-205.

Dimitrov I, Stancheva I, Mitova I, Atanasova E. 2005. Quality and yield of lettuce in dependence on different fertilizer sources. Bulg. J Agr. Sci. **5,** 589-594. ISSN: 1310-0351.

Doring HW, Gericke R. 1986. The efficiency of foliar fertilization in arid and semi-arid regions. In: A. Alexander (Ed.), Foliar Fertilization. Kluwer Acad. Publishers, Dordrecht, the Netherlands 29-35.

Ejaz M, Waqas R, Ayyub CM, Butt M, Shuaib-ur-Rehman F, Bashir AM. 2012. Efficacy of zinc with nitrogen as foliar feeding on growth, yield and quality of tomato grown under poly tunnel, Pak. J. Agri. Sci **49(3),** 331-333.

El-Nemr MA, El-Desuki, El-Bassiony AM, Fawzy ZF. 2012. Response of growth and yield of cucumber Plants (*Cucumis sativus* L.) to different foliar applications of humic acid and Bio-stimulators, Australian Journal of Basic and Applied Sciences **6(3),** 630-637.

Fawzy ZF, El- Bassiony AM, Behairy AG, Helmy YI. 2010. Effect of Foliar Spraying by Some Bio and Organic Compounds on Growth, Yield and Chemical Composition of Snap bean Plants, Journal of Applied Sciences Research **6(12),** 2269-2274.

Fernández V, Eichert T. 2009. Uptake of hydrophilic solutes through plant leaves: current state of knowledge and perspectives of foliar fertilization, Critical Reviews in Plant Sciences v. 28. I83 **182,** 36-68.

Gad El-Hak SH, Ahmed AM, Moustafa YMM. 2012. Effect of Foliar Application with Two Antioxidants and Humic Acid on Growth, Yield and Yield Components of Peas (*Pisum sativum* L.), Journal of Horticultural Science & Ornamental Plants **4(3),** 318-328.

Hussein MM, El-Faham SY, Alva AK. 2012. Pepper plants growth, yield, photosynthetic pigments, and total phenols as affected by foliar application of potassium under different salinity irrigation water, Agricultural Sciences **3(2),** 241-248.

Jaskulski D. 2007. Comparison of the effect of foliar fertilization on economic and production effect of growing some field crops, Fragmenta Agronomica (Poland) **24(93),** 106112.

Kannan S. 2010. Foliar fertilization for sustainable Crop production, Sustainable Agriculture reviews, 1, Genetic Engineering, Biofertilization, Soil quality and Organic Farming. 2010; vol. 4. VI. 2010; 371-402 Annual Review & Research in Biology **3(4),** 455-465, 2013 462.

Kannan S. 2010. Foliar fertilization for sustainable Crop production, Sustainable Agriculture reviews, 1, Genetic Engineering, Biofertilization, Soil quality and Organic Farming **4(VI),** 371-402

Karakurt Y, Unlu H, Padem H. 2009. The influence of foliar and soil fertilization of humic acid on yield and quality of peper., Acta Agricultural Scandinavica, Section B- Plant Soil Science **59(188. 3),** 233-237.

Kerin V, Berova M. 2003. Foliar fertilization in plants. Videnov & Son, Sofia. Bulgarian.

Kosterna E, Zaniemicz-Bajkowska A, Franczuk J, Rosa R. 2009. Effect of foliar feeding on the yield level and quality of six large – fruit melon (*Cucumis melo* L.), Acta Scientiarum Polonorum, Hortorum Cultus **8(3),** 13-24.

Kuepper G. 2003. Foliar Fertilization Current Topic, ATTRA- National sustainable Agriculture Information service, NCAT Agriculture specialist.

Lovatt CJ. 1999. Management of foliar fertilization, Terra **17.(n 3),** 257-264.

Maheswari TU, Haripriya K. 2008. Response of hot pepper (*Capsicum annumm* L.) cv. K2 to various sourses of organic manures and foliar nutrients, The Asian Journal of Horticulture **3(1),** 51-53.

Masarirambi MT, Hlawe MM, Oseni OT, SIbiya TT. 2010. Effects of Organ (*Lactuca sativa* L) '*Veneza roxa*. Agriculture and Biology Journal of North America **1(6),** 1319-1324.

McCall W. 1980. Foliar application of foliar fertilizers, Hwaii cooperative extension service, University of Hawaii, General hove garden series. 24.

Mondal MMA, Malek MA, Puteh AB, Ismail MR, Ashrafuzzaman M, Naher L. 2012. Effect of foliar application of chitosan on growth and yield in okra, AJCS **6(5),** 918-921.

Pavlova A, Michailova T. 2009. Foliar fertilization profitable technology. Laktofol- 20 years science and practice, Sofia. 144.

Poberezny J, Wszelaczynska E, Kentgen AJ. 2012. Yield and chemical content of carrot storage roots depending on foliar fertilization with magnesium and duration of storage. J. Elem. 479-494.

Premsekhar M, Rajashree V. 2009. Performance of Hybrid Tomato as Influenced by Foliar Feeding of Water Soluble Fertilizers, American- Surasian Yournal of Sustainable Agriculture **3(1),** 33-36.

Smoleń S, Włodzimierz S. 2009. The effect of nitrogen fertilizer form and foliar application on the concentrations of twenty-five elements in carrot, Folia Horticulturae. Ann. **21/1,** 3-16.

Taiz L, Zeiger E. 1998. Plant physiology. Second edition, Sinamer Associates, Inc, Publishers Sunderland Massachusetts, USA 113-124.

Tukey HB, Marczynski S. 1984. Foliar nutrition-old ideas rediscovered. Acta Hort **145,** 205-212.

Wojcik P. 2004. Uptake of mineral nutrient from foliar fertilization. Journal of Fruit and Ornamental Plant Research, Special edition **12,** 201-218.