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Influence of Adding Sugar Cane Residuals and Rice Straw in Presence of Emmicroorganisms to the Soil with Using Some Irrigation Intervals, on Growth, Fruit Yield and its Quality of Eggplant

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Abstract: This experiment aimed to study effect of using three irrigation intervals, every (5, 10or 15 day) which distributed in the main plots and eight different organic treatments as adding to the soil, this materials werefilter cake, bagasse as sugarcane residuals and rice straw with or without effective microorganisms (EM) whichthis materials consider favorable organic matter and enhancing with holding water capacity of the soil, this materials were arranged in the sub plots and their interactions on eggplant (*Solanum melongena* L.) cv. Laala-2 plantsunder furrow irrigation system at Experimental Farm of Kaha Station, Qalubia Governorateduring two summer seasons of 2018 and 2019 years. The results of this study revealed that irrigation intervals significantly affected on the eggplant vegetative growth characters i.e., (plant length, stem diameter, number of leaves and branches/plant, leaf area/plant as well as plant dry weight), fruit characteristicsi.e., (fruit length, fruit diameter, fresh fruit weight and dry matter percent), chemicals properties on eggplant fruits and chlorophyll in the leavesas well as fruits number/plant, early yield (ton/fed) and total fruit yield (ton/fed). Also, adding of filter cake, bagasse and rice straw with or without effective microorganisms (EM) under two irrigation intervals, i.e., irrigate every 5 days or 10 days induced significant effect on all vegetative growth parameters, fruit characteristics, chemicals properties on fruits, fruits number/plant, early yield (ton/fed) and total fruit yield (ton/fed) comparing to the control (without addition any compound), Regarding the interaction effects between irrigation intervals and addingthe previous organic materials, the obtained data indicated that, adding of rice strawat 1.5ton/ fed. + EM 3L/ ton or Filter cake 5 ton / fed. + EM 3L/ ton or bagasse at 1.5 ton / fed. + EM 3L/ ton with irrigation every 5 or 10 days gave the highest values of all vegetative growthparameters, fruit characteristics, chemicals properties on eggplant fruits and chlorophyll in the leaves of eggplant plants. Generally, it can recommend by using soil application ofrice straw 1.5ton/ fed. + EM 3L/ ton orbagasse 1.5 ton / fed. + EM 3L/ ton or Filter cake 5 ton / fed. + EM 3L/ ton with irrigation every 5 or 10 days without any differences between the two irrigation intervals and this mean that increased the irrigation period without any injury or statistical effect on the fruit crop to obtain high eggplantfruit yield with height quality. Another meaning, it can under water irrigation deficit using one of the previous organic materials, i.e., rice straw at 1.5 ton / fed or filter cake at 5 ton / fed with EM at 3 liter/ ton on either using irrigation every 10 days or 15 days without significant differences on eggplant fruit yield and quality comparing to irrigate the eggplant every 5 days without adding any one of the previous materials and saving more than 30% from irrigation quantity.

Key words: Eggplant · Irrigation intervals · Filter cake · Bagasse · Rice straw · EM

INTRODUCTION

Eggplant, *Solanum melongena* L., is a member of the Solanaceae family, it is one of the most important and popular vegetables in many parts of the subtropical regions. Whereas, eggplant is a favorite vegetable crops cultivated in Egypt during summer and autumn seasonsfor local consumption and exportation. Eggplant fruits contain a considerable amount of carbohydrates, proteins and some minerals i.e., nitrogen, phosphorus, potassium and iron as well as vitamin "C" Mahmoud [1] and hence, it is important for human nutrition.

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Since the last decade, Egypt suffering from water reduction resources for irrigation the cultivation area. On the other hand, irrigation water is considered as the first main factors that greatly affect on plant growth and productivity. In agriculture, water and nutrients are the two most critical inputs and their efficient management is important not only for higher productivity but also for maintaining environmental quality. Vegetables have been found particularly responsive to fertigation due to their continuous need of water and nutrients at the optimal rate to give high yield with good quality, high capital turnover to investments and may be their cultivation by more skilled farmers [2]. The proper irrigation interval can play a major role in increasing the water use efficiency and the productivity by applying the required amount of water when it needed. Abd El-Aal *et al*. [3] on eggplant, indicated that the bitter vigor plant growth, the heavier early and total yield were recorded when eggplant irrigated at shorter period i.e.at 10 days intervals. Ebrahim *et al.* [4] studied the effect of irrigation on yield components and water use efficiency of eggplant, they used three irrigation intervals (no irrigation, every 6 days and 12 days interval). The results of this study showed that among irrigation treatments the highest values of all studies trails of eggplant included plant height, fruit length, fruit diameter, number of leaves, number of fruits, water use efficiency and fruit yield were observed in 6 days interval irrigation. Also Pirboneh *et al.* [5] reported that irrigation of eggplants every 6 days and applied of 2 cm mulch per plant results in the highest yield, i.e., 51.1 ton / ha. Also Fayza *et al*. [6] noticed that the irrigation eggplant every 5 days interval gave the best fruit qualities expressed as led to reduction in the fruit firmness and its content from total phenols and total sugars however increasing the period of irrigation led to increase total soluble solids, total sugar and total phenols. Shalata [7] showed that vegetative growth parameters, yield components and fruit quality of eggplant were significantly decreased with increasing irrigation intervals from 10 up to 20 days. Rakha [8] indicated that shorter irrigation interval had significant increases in all growth measures of eggplant. Meanwhile, the irrigation intervals it had significant increases in yield and yield components of eggplant, i.e., number of fruits per plant, average yield. The highest values were obtained from 10 days intervals treatment. El-Said [9] reported that the data indicate that irrigation every 10 days recorded the highest significant values of vegetative growth characteristics, *i.e.*, fresh and dry weight of plant, as well as leaf area per sugarcane plant. Moreover, Abd El-Hady and Samar -Doklega [10] fount that, irrigation intervals every 10 days gave significant increments in vegetative growth, yield and its component of eggplant, while quality determinations values *i.e.* crude protein, total carbohydrates, crude fiber and vitamin C were increased significantly when irrigation intervals were every 15 days.

In can using some natural organic materials for enhancing water use efficiency and decrease number of irrigation times, in this regard, Diaz [11] found that sugar press mud or the sugarcane filter-cake is the residue of sugarcane industry which results from the processing of sugarcane where sugar mud is separated from the crush. The total supply of sugar press mud varies from (1-7) kg from the processing of 100 kg of sugarcane. Also, he found that, addition of press mud manure in the soil increases the moisture content of the soil which avoids frequent watering of plants. Also, El-Sayed *et al*. [12] indicated that filter cake applications to crops increased soil concentrations of organic matter, organic carbon, total nitrogen and available phosphorus. Sardar *et al.* [13] indicated that, filter-cake includes plant growth regulators, hormones, auxins, enzymes and vitamins resulting in improvement of soil aeration and better root proliferation. Since it is non-toxic, it can be widely encouraged and it helps to retain moisture content of the soil. Oliveira *et al.* [14] indicated that, Press mud is the source of several nutrients which supports the growth of microorganisms in soil despite the growth of disease causing fungi. Several isolates of fungi are allowed to multiply in fresh and compost fertilizer of press mud. Treated press mud fertilizer limits the growth of such harmful microbes permitting the multiplication of beneficial fungi producing stable enzymes. However, El-Bolok [15] indicated that, fertilizing with filter cake at 50 and 100% of N either alone or with EM and/ or yeast each at 0.2% was considerably effective in stimulating all growth aspects, leaf contents of pigments, N, P, K, Mg, Ca, Zn, Fe, Mn and Cu, marketable yield (kg) and both physical and chemical characteristics of the fruits relative to the control.

In addition, both of the sugar cane bagasse and rice straw, industries burn their wastes thereby, contributing tremendously to environmental pollution thus, leading to polluted air, water and land. This process also releases large amounts of carbon dioxide in the atmosphere, a main contributor to global warming together with dust particles. Burning also destroys the soil organic matter content, kills the microbial population and affects the physical properties of the soil [16]. It can using this residuals after

composing as organic fertilizers for which its consider as a natural fertilizercrop cultivation using organic fertilizers has contributed for decomposition of residues and improving physical and chemical properties of soil that is important for biological development [17].

Rice straw residues (RS) are important natural resource and recycling of these residues improves soil physical, chemical and biological properties [18, 19]. Soil pH is greatly influenced by addition of organic matter (OM) through different organic amendments [20]. Bryan and Jeff [21] revealed that the organic materials contain carbon, which serves as a food resource for soil organisms such as bacteria, algae, fungi and earthworms. They also found that increasing levels of soil humus has a many numbers of benefits for plants which increased water and nutrient holding capacity, reserve of slow release nutrients, resistance to soil pH change and soil warmth. Furthermore, humic acid increased stimulation of plant growth regulators as hormones. However, RS is an easily decomposable organic material that provides major substrates for methanogens that contribute to methane (CH_4) and carbon dioxide (CO_2) production resulting in increases in the global warming potential [22]. Hala El-Sayed, *et al.* [23] indicated that, rice residues (RS) application (4 t/fed) caused significant increases on plant height, number of leaves/plant, plant leaf area, fresh weight of leaves, dry weight of leaves, total chlorophyll, N, P and K percentages in eggplant leaves as compared with the control treatment (without organic fertilization). Also, they found that, Application of rice residues (RS) caused significant increases on early yield weight, yield weight, total yield weight, fruit weight, diameter, height and firmness as compared with control treatment (without organic fertilization). Hamed *et al.* [24] obtained that the various aqueous agricultural residues extract application to wheat and barely plants results in an improvement in plant growth and production especially in treatments of 100% rice straw extract, followed by 50% bagasse with 50% nitrogen mineral fertilizer treatment compared to mineral fertilizer only as the control.

Moreover, several investigators mentioned that, it can adding some soil organisms to the soil in the presence of plant residues consider as benefit factor to the soil or the plants, in this regard it found that effective microorganisms (EM) has beneficial effect in inoculating different cultures of microorganisms into soil whereas, EM contains selected species of microorganisms including three principal types, namely, lactic acid bacteria, yeast, actinomyces and photosynthetic bacteria that are commonly found in soils. Moreover, EM application increased number of the soil micro flora i.e. total bacteria, total actinomyces and total fungi which are the producersof indole acetic acid and gibberellins leads to improve growth of root system that reflected on enhancing the uptake of nutrients, thereby the microbiological equilibrium and create an environment that is favorable to the growth and health of the plants. It is capable for enhancing N fixation, organic matter, nutrient and water uptake and root development, as well as for reducing soil pH that is responsible for increasing the availability of different nutrients [25, 26]. In addition Higa [25] and Higa and Wididana, [27] reported that, enhancement effect of EM on improving growth and leaf minerals content may be attributed to the fact that EM have beneficial effect on lowering soil pH and increasing the uptake of water and nutrients. Moreover, applied of EM is notorious to augment the microbial diversity of soil and plants, improve soil quality and increase yield and quality of crops [28]. Also, adding EM to the soil increased the vegetative growth, leaf area, leaf chlorophyll and leaf mineral values (N, P, K, Fe, Zn and Mn) as compared with the untreated Le Conte pear tree [29]. While, Kotwica *et al.* [30] found that, the application of effective microorganisms (EM) in plowing tillage caused an increase insoil compaction at all depths and moisture content of the deepest layer. Also, when it used in direct sowing resulted in higher moisture content primarily in the surface layer. Meanwhile, Kotwica*et al.* [30] cleared that, the use of rice straw did not affect significantly soil moisture but application of the effective microorganisms and the interaction among those factors significantly affected soil moisture and compaction. The influence of the effective micro-organisms on soil moisture is the most significant in plowing tillage, while the effect of straw on soil compactionis the most evident for direct sowing.

This study was aimed to explore the possibility ofaddingrice straw and someresiduals of sugar cane products i.e., filter cake and bagassewhich increased water and nutrient holding capacity with or without Effective microorganisms (EM) and their interactions on eggplant (*Solanum melongena* L.) plants and the reflection of that on keeping water capacity, enhancing eggplant fruit yield and its quality.

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Farm of Kaha, Qalubia Governorate, Egypt.,

Table 1: The compositions of the residuals of sugar caneproducts (Filter cake)

Constituent	Concentrations	Constituent	Concentrations
Weight (M^3)	545 Kg	P_2o_5%	1.11
Moisture %	66	K_2o %	0.36
Organic matter%	65.58	Ca %	2.7
Organic carbon %	38.04	Mg %	1.1
Ash %	34.42	S %	0.2
C/N ratios	1 : 19	PH	8.2
Total N %	1.99	----	---

Table 2: The compositions of the residuals of sugar caneproducts (Bagasse)

Constituent	Concentrations	Constituent	Concentrations
Moisture%	8.65	Cao %	2.8
organic matter%	94.91	Mgo%	3.2
Organic carbon %	50.03	Sio2 %	4
Ash %	4.0	Cellulose	46
Total N %	1.857	Lignin	23
Total P %	0.345	Silica %	9.78
K_2o %	2.4	----	---

Table 3: The compositions of the(Rice straw)

Parameter	Concentrations	Parameter	Concentrations
Organic Matter%	43.45	Phosphorus%	0.19
Crude Protein%	4	Fibre%	37
Crude Fibre%	37	Cellulose%	11.4
C/N ratios	23 : 45	Hemicellulose %	10.0
N %	1.08	Lignin%	8
C %	26.35	Silica%	20.3
Potassium %	0.14	PH	4.85
Total ash%	18	EC	5.15
Calcium%	0.14	---	---

during the two successive summer seasons of 2018 and 2019 to investigate the effect of irrigation intervals, soil applications of (rice straw and some residuals of sugar cane products i.e., filter cake and bagasse) with or without Effective microorganisms (EM) and their interactions on eggplant (*Solanum melongena* L. cv. Laala-2) plants.

Seeds of eggplant were sown under plastic house in the nursery at the third week of January duringthe both 2018 and 2019 seasons and received the recommended agricultural practices of the nursery. After 55 days from seeds sowing, healthy seedlings were selected and transplanted in the open field at 40 cm apart between the seedlings in one side of the ridge (4.0m length and 0.7 m width). The plot area was (8.4 m^2) which includes 3 ridges. The soil was clay in texture with 7.4 PH, 3.4 EC m mhos, 1.5% organic matter, 111 ppm N, 51 ppm P and 100 ppm K. Filter cake, bagasse and rice straw were mixed separate with the soil before transplanting during adding, (bagasse and rice straw were grinded to powder with granularity of 3-5 mm). Its added to depth of 10-15 cm layer of soil surface. The other agricultural practices were followed according to the recommendation for eggplant plantation. The chemical analysis offilter cake, bagasse and rice straw were shown in Tables 1, 2and 3. The compounds present and their percentage in total of 100 grams are given in Table 2 which is provided below.

The experiment contained Twenty four treatments; were arranged in split- plots design system with three replicates was adopted, Three water irrigation intervals (5, 10 and 15 days) were distributed in the main plots, whereas eight treatments of the adding Filter cake, bagasse and rice straw with or without effective microorganisms (EM) were arranged in the sub plots.

Main Plots: Irrigation intervals:

- Irrigation plants every 5 days
- Irrigation plants every 10 days
- Irrigation plants every 15 days

Sup Plots: Adding different organic sources to the soil:

- Filter cake 5 ton / fed.
- Filter cake 5 ton / fed. + EM 3L/ ton.
- Bagasse 1.5ton/ fed.
- Bagasse 1.5ton/ fed. + EM 3L/ ton.

- Rice straw1.5ton/ fed.
- Rice straw 1.5ton/ fed. + EM 3L/ ton.
- EM 5L/ fed.
- Control (without addition any compound).

The following data were recorded as follows:

Vegetative Growth Parameters: Three plants were chosen randomly from each treatments in the three replicates at the beginning of fruit set stage (after 85 days from transplanting) in order to determine the following: plant height (the length of main stem cm), stem diameter (cm), number of leaves and branches /plant, leaf area as well as average of plant dry weight (weights of leaves and stems/ plant (g).

The leaf area was calculated according to the following formula of Wallace and Munger [31].

Leaf area (cm^2) = Leaves dry weight (g) x disk area / Disk dry weight (g)

Fruit Yield and its Characteristics: Five eggplant fruits were randomly selected from each plot at the second picking to determine the following data:

Fruit length (cm) - Fruit diameter (cm) -Average fruit weight (g) - Dry matter percent in fruit, 100 g from fruits was taken and dried at 70°C till constant weight and the dry weight was determined – Number of fruits / plant- fruits yield / plant (kg), earlyand total fruits yield (ton/fed) were estimated.

Chemical Properties: Total nitrogen, potassium and phosphorwere determined in the dry fruits on the basis of dry weight according to the methods described by Bremner and Mulvaney [32], Olsen and Sommers [33] and Chapman and Pratt [34] respectively.

Total leaf chlorophyll was measured using Minolta chlorophyll meter. SPAD-501as SPAD units.

Statistical Analysis: All data were subjected to the statistical analysis of variance and treatment means were compared according to the Least Significant Differences (L.S.D. at 5 % level) test method as described by Snedecor and Cochran [35].

RESULTS AND DISCUSSION

Vegetative Growth

Effect of Irrigation Intervals: The data in Table 4 revealed that irrigation intervals significantly affected on the eggplant vegetative growth characters which determined in this study i.e., plant length, stem diameter, number of leaves and branches/plant, leaf area/plant as well as plant dry weight, these results were true in both growing seasons except stem diameter in the first season which did not reach to significant level. The highest significant values of the studied parameters were recorded with irrigation intervals every 5 days during both seasons except stem diameter and plant dry weight in the second season. These results may be due to increasing water quantity applied by shortage period, gave a good opportunity to increase nutrients movement in the soil solution, which raised the availability to plant roots absorption and the translocation through plant tissues which in turn, increased the accumulation of nutrients compounds in the plants and consequently reflect on plant growth. The results are in harmony with those reported by Abd El-Aal *et al*. [3]; Ebrahim *et al*. [4]; Fayza *et al*. [6]; Shalata [7]; Rakha [8]; El-Said, [9] and Abd El-Hady and Samar -Doklega [10] on eggplant.

Effect of Adding Different Organic Sources to the Soil: As shown in Table 4 the soil applications of Filter cake, bagasse and rice straw with or without effective microorganisms (EM) were induced significant effect on all vegetative growth parameters of eggplant plant i.e., plant length, stem diameter, number of branches and leaves / plant, leaf area/plant and dry weight/ plant, comparing to the control (without addition any compound), these results were true in both growing seasons. Especially the treatmentsof adding filter cake, bagasse and rice straw with effective microorganisms (EM) which gave the highest values. These results may be due toaddition of filter-cake in the soil whereas increased the moisture content of the soil which avoids frequent watering of plantsand that ismean increased soil concentrations of organic matter, organic carbon, total nitrogen and available phosphorus, it containalso plant growth regulators, hormones, auxins, enzymes and vitamins which led to improvement of soil aeration and betterroot proliferation and it helps to retain moisture content of the soil. In addition, filter cake is the source of several nutrients which supports the growth of microorganisms in the soil despite the growth of disease causing fungi [11-14]. However, El-Bolok [15] indicated that, fertilizing with filter cake at 50 and100% of N either alone or with EM and/ or yeast each at 0.2% was considerably effective in stimulating all growth aspects.

Meanwhile, Both the sugar cane bagasse and rice strawimproves soil physical characters, chemical and biological properties whereas, organic materials contain carbon, which serves as a food resource for soil

Table 4: Effect of irrigation eggplant plants by using irrigation intervals and adding some organic sources, i.e., rice straw and some residuals of sugar cane products i.e., filter cake and bagasse with or without (EM) microorganisms on the vegetative growth during the two seasons of 2018 and 2019

	Plant length (cm)		Stem diameter (cm)		No. of. branches/ plant		No. of. leaves/ plant		Leaf area/plant		Dry weightplant/ (g)	
Treatments	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Irrigation intervals												
Every 5 days	57.19	57.87	1.53	1.56	14.35	13.92	158.85	170.46	408.37	406.39	83.43	84.06
Every 10 days	50.85	54.93	1.47	1.58	12.94	13.17	135.05	164.13	384.25	392.90	81.44	82.92
Every 15 days	50.31	56.26	1.51	1.75	11.29	12.44	142.97	157.03	388.79	390.20	81.24	87.79
L.S.D at 5 % level	0.89	0.99	NS	0.09	1.26	1.08	11.159	6.116	13.32	10.43	1.59	2.49
Adding some organic sources to the soil												
Filter cake	52.99	58.833	1.41	1.58	12.78	13.89	137.11	173.89	382.83	390.02	79.27	85.68
Filter cake+ EM	55.13	60.60	1.52	1.68	13.11	14.78	154.72	188.25	415.35	423.96	84.59	92.51
Bagasse	53.50	59.59	1.59	1.58	13.44	14.17	153.92	172.17	432.41	420.74	90.17	87.93
Bagasse+ EM	56.97	60.32	1.56	1.78	14.17	15.17	165.50	185.42	439.75	434.53	94.04	96.43
Rice straw	48.54	52.79	1.47	1.80	13.22	13.50	150.54	174.17	401.45	411.88	79.39	81.41
Rice straw+ EM	58.29	59.97	1.73	1.83	14.22	13.67	173.50	187.50	435.56	436.98	89.55	88.51
EM	50.89	52.10	1.50	1.52	11.28	10.78	128.06	132.11	370.82	382.98	76.59	84.50
Control	45.98	46.67	1.23	1.27	10.67	9.44	101.67	97.48	272.27	270.87	62.69	62.39
L.S.D at 5 % level	0.86	1.24	0.13	0.15	1.57	1.09	7.714	6.29	14.72	14.30	2.53	2.61

organisms such as bacteria, algae, fungi and earthworms all of that increasing levels of soil humus has a number of benefits for plants which increased water and nutrient holding capacity, reserve of slow release nutrients, resistance to soil pH change and soil warmth. Furthermore, humic acid increased stimulation of plant growth as mentioned by Bryan and Jeff [21]; Walker *et al.* [20]; Mandal *et al.* [18]; Brar and Walia [19] and Galbiattia *et al*. [17]. However, Hala- El-Sayed *et al.* [23] indicated that, rice residues (RS) application (4 t/fed) caused significant increases on plant height, number of leaves/plant, plant leaf area, fresh weight of leaves and dry weight of leaves as compared with the control treatment (without organic fertilization). Hamed *et al.* [24] reported that the various aqueous agricultural residues extract application to wheat and barley plants results in an improvement in plant growth and production especially in treatments of 100% rice straw extract, followed by 50% bagasse with 50% nitrogen mineral fertilizer treatment compared to mineral fertilizer only as a control.

Concerning the role of Effective microorganisms (EM), it has beneficial effect whereas, EM application increased number of the soil micro flora i.e. total bacteria, total actinomyces and total fungi which are the producers of indole acetic acid and gibberellins and that leads to improve growth of root system that reflected on enhancing the uptake of nutrients, thereby the microbiological equilibrium and create an environment that is favorable to the growth and health of plants. It is capable for enhancing N fixation, organic matter, nutrient and water uptake and root development, as well as for reducing soil pH that is responsible for increasing the availability of different nutrients and improving growth [25-27]. Moreover, adding EM to the soil increased the vegetative growth and leaf area, as compared with the untreated Le Conte pear tree [29]. While, Kotwica *et al.* [30] cleared that, the use of rice straw did not affect significantly soil moisture but application of the effective microorganisms and the interaction among those factors significantly affected soil moisture and compaction. The influence of the effective micro-organisms on soil moisture is the most significant in plowing tillage, while the effect of straw on soil compaction is the most evident for direct sowing.

Effect of the Interactions Between Irrigation Intervals and Adding

Different Organic Sources to the Soil: Data illustrated in Table 5showed that the effect of interactions among treatment sindicated that, addingof rice strawat 1.5ton/ fed. + EM 3L/ ton with irrigation every 5 days give superiority values in plant length, stem diameter, number of branches and leaves / plant and leaf area/plant in the first season.Meanwhile, using bagasse 1.5 ton/ fed. + EM 3 L/ ton with all irrigation intervals give the highest values of dry weight of foliage per plant in both growing seasons. In addition, filter cake 5 ton / fed. + EM 3L/ ton with irrigation every 5 days was the best treatment for number of branches and leaves / plant in the second season. Generally, it can said that, all the sources of organic materials with the three irrigation intervals gave significant values of plant growth comparing with the control where as the irrigation every 5 days was the superior then the irrigation every 10 days in the presence of adding the organic materials.

Table 5: Effect of the interaction between irrigation intervals and adding some organic sources, i.e., rice straw, some residuals of sugar cane products i.e., filter cake and bagasse with or without microorganisms (EM) on vegetative growth of eggplants during the two seasons of 2018 and 2019

		Plant length (cm)		Stem diameter		No. of. branches/ plant		No. of. leaves / plant		Leaf area /plant		Dry weightplant/(g)	
Treatments		2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Every 5 days	Filter cake	60.50	59.67	1.40	1.57	13.00	14.00	150.33	180.67	359.52	441.50	77.76	88.50
	Filter cake+ EM	63.08	61.13	1.60	1.60	15.00	15.50	164.00	194.00	454.20	453.00	84.93	92.60
	Bagasse	55.17	59.50	1.67	1.45	14.00	14.50	172.00	172.00	470.76	398.35	93.70	86.98
	Bagasse+ EM	57.83	62.03	1.65	1.75	16.00	15.33	180.00	188.00	462.91	406.12	94.17	94.97
	Rice straw	51.07	51.70	1.40	1.65	13.67	14.00	165.00	170.50	388.67	439.05	74.15	73.34
	Rice straw+ EM	65.17	61.25	1.75	1.70	16.67	15.00	192.50	186.50	463.46	464.76	93.38	88.95
	EM	59.13	55.13	1.60	1.45	13.83	12.00	138.00	127.00	375.71	389.11	84.47	82.61
	Control	45.60	52.67	1.20	1.32	12.67	11.00	109.00	113.00	291.74	292.88	64.87	64.51
Every 10 days	Filter cake	50.17	58.83	1.40	1.60	13.33	13.67	128.00	150.00	395.86	366.85	77.15	80.85
	Filter cake+ EM	53.33	59.17	1.45	1.63	12.33	14.00	138.00	174.00	391.23	414.76	82.17	89.35
	Bagasse	53.20	58.17	1.42	1.70	15.67	15.00	144.00	180.00	412.26	419.44	89.60	83.65
	Bagasse+ EM	57.17	57.25	1.43	1.70	13.50	15.50	150.50	190.25	427.60	465.08	93.10	91.43
	Rice straw	48.60	54.00	1.55	1.65	14.67	14.50	134.25	143.00	396.76	409.57	83.80	85.16
	Rice straw+ EM	54.20	56.67	1.75	1.60	12.33	13.00	168.00	180.00	421.64	436.23	88.13	88.27
	EM	45.50	51.17	1.50	1.45	10.33	10.67	115.17	119.00	363.22	363.29	75.93	81.99
	Control	44.67	44.17	1.23	1.33	11.33	9.00	102.50	92.44	265.43	267.96	61.63	62.65
Every 15 days	Filter cake	48.30	58.00	1.43	1.57	12.00	14.00	133.00	167.00	393.09	361.70	82.90	87.68
	Filter cake+ EM	48.97	61.50	1.50	1.80	12.00	14.83	162.17	183.75	400.62	404.10	86.70	95.58
	Bagasse	52.13	61.10	1.70	1.60	10.67	13.00	145.75	164.50	414.22	444.43	87.20	93.17
	Bagasse+ EM	55.90	61.67	1.60	1.90	13.00	14.67	166.00	178.00	428.75	432.39	94.83	102.90
	Rice straw	45.97	52.67	1.47	2.10	11.33	12.00	152.38	179.00	418.94	387.01	80.22	85.73
	Rice straw+ EM	55.50	62.00	1.70	2.20	13.67	13.00	160.00	190.00	421.57	409.96	87.15	88.32
	EM	48.03	50.00	1.40	1.67	9.67	9.67	131.00	147.00	373.54	396.56	69.37	88.91
	Control	47.67	43.17	1.27	1.17	8.00	8.33	93.50	87.00	259.63	251.76	61.57	60.00
L.S.D at 5 % level		0.52	0.75	NS	0.09	NS	NS	4.6817	4.1669	8.9304	8.6661	1.537	1.582

Table 6: Effect of using irrigation intervals, soil applications (rice straw and some residuals of sugar cane products i.e., filter cake and bagasse) with or without effective microorganisms (EM) on the fruit characters of eggplants fruits during the two seasons of 2018 and 2019

	Fruit length (cm)		Fruit diameter (cm)		Fresh fruit weight (g)		Dry matter in fruit %	
Treatments	2018	2019	2018	2019	2018	2019	2018	2019
Water irrigation intervals								
Every 5 days	13.900	14.717	2.2958	2.5875	42.119	45.815	9.10	9.40
Every 10 days	13.537	13.758	2.4083	2.5583	41.435	43.237	9.84	9.76
Every 15 days	13.683	13.575	2.4958	2.3708	40.641	42.108	10.09	9.72
L.S.D at 5 % level	0.3207	0.4142	0.1168	0.1425	0.6312	0.4837	0.215	0.22
Soil applications								
Filter cake	13.578	14.900	2.3667	2.5778	41.160	46.027	9.822	9.32
Filter cake+ EM	13.922	14.844	2.4333	2.6111	42.340	47.357	10.017	9.45
Bagasse	14.233	14.133	2.4000	2.4111	43.597	45.414	9.544	9.74
Bagasse+ EM	14.378	14.744	2.3667	2.5222	43.193	45.613	10.122	9.99
Rice straw	14.211	13.933	2.4000	2.4889	42.207	43.446	9.772	9.84
Rice straw+ EM	14.433	14.656	2.5111	2.5222	42.983	43.840	9.989	10.05
EM	13.711	12.633	2.4111	2.5444	41.137	41.186	9.267	9.50
Control	11.189	12.289	2.3111	2.3667	34.570	36.878	8.878	9.11
L.S.D at 5 % level	0.6096	0.3649	0.1028	0.1191	0.7939	0.8642	0.3687	0.37

Fruit Characteristics

Effect of Irrigation Interval: It is obvious from data in Table 6 that, the change in irrigation interval has a significant effect on fruit length, fruit diameter, fruit fresh weight and dry matter percent in the eggplant fruit comparing to the control, whereas, the highest values of fruit length and fruit fresh weightwere obtained with irrigation intervalevery 5 days, meanwhile, dry matter percent in fruitincreased by increasing irrigation interval from 5 up to 15 days. These results were true during both seasons. As mentioned by Ebrahim *et al.* [4] and Shalata [7] on eggplant.

Effect of Adding Different Organic Sources to the Soil: It is worth to mention from the data in Table 6 that, fruit length, fruit diameter, fruit fresh weight and dry matter percent in eggplant fruit were significantly increased in response to the soil application offilter cake, bagasse and

rice strawenriched or not with effective microorganisms (EM)comparing to the control (without addition any compound), these results were true in both growing seasons. Especially the treatments of the soil applications of filter cake, bagasse and rice straw enriched with effective microorganisms (EM) which gave the highest values. It can said that these treatments as shown in Table 2 showed obvious, increasing in plant growth which that reflect on fruitcharacteristics. These results are in agreements with those obtained by Hala- El-Sayed, *et al.* [23] in eggplant which indicated that, rice residues (RS) application (4 t/fed) caused significant increases on fruit weight and fruit diameter as compared with the control treatment (without organic fertilization).

Effect of the Interactions Between Irrigation Intervals and Adding Different Organic Sources to the Soil: The statistical analysis of the obtained data in Table 7 indicated that, all the organic treatments used in this study induced significant effect at 5% level on fruit length, fruit diameter and fresh fruit weight of eggplant plant. The best treatments were obtained from the interaction between addingfilter cake, bagasse and rice straw enriched or not with effective microorganisms (EM) comparing to the control (without addition any compound) with irrigation intervals every 5 days or every 10 days these results were true in both growing seasons. In another meaning the interaction between any one of filter cake, bagasse and rice straw with EM or without it and the three intervals irrigation showed significant values of fruit quality without differences between them.

Total Fruits Yield of Eggplant Plants

Effect of Irrigation Interval: The obtained results in Table 8 revealed that fruits number/plant, early yield (ton/fed) and total fruit yield (ton/fed) were significantly increased with change in irrigation intervals, the highest values were registered with irrigation intervals every 5 days or 10 day, respectively in both growing seasons. It could be suggested that water plays great role which induced important function in all physiological processes starting from mineral absorption from the soil up to building different components inside the plant and finally the yield which consider the finale step of plant growth and development. These results were in agreement with Abd El-Aal *et al*. [3] on eggplant, indicated that the heavier early and total yield were recorded when eggplant irrigated at shorter period i.e.at 10 days intervals. Ebrahim *et al.* [4] showed that, among irrigation treatment, the highest amount of all studies trails of eggplant included number of fruitsand fruit yield were increased significantly under using 6 days interval irrigation level. Also, Shalata [7] showed that yield components of eggplant were significantly decreased with increasing irrigation intervals from 10 up to 20 days. Rakha [8] indicated that the irrigation intervals it had significant increases in yield and yield components of eggplant, i.e., number of fruits per plant, average yield. The highest values were obtained from 10 days intervals treatment. Moreover, AbdEl-Hady and Samar -Doklega [10] found that, irrigation intervals every 10 days gave significant increments in eggplant yield and its component.

Effect of Adding Different Organic Sources to the Soil: According to the data in Table 8 indicated that, fruits number/plant, early yield (ton/fed) and total fruit yield (ton/fed) showed significant results by adding different treatments of the organic sources as comparing with the control (without addition any compound), these results were true in both growing seasons. The treatments i.e., filter cake, bagasse and rice straw enriched with effective microorganisms (EM) which gave the highest values. It can said that the treatments as shown in Table 4 showed obvious, increasing in plant growth which that reflect on fruitcharacteristics in Table 6 as follow fruits number/plant, early yield and total fruit yield. In this regard, El-Bolok [15] indicated that, fertilizing with filter cake at 50 and 100% of N alone or with EM and/ or yeast each at 0.2% was considerably effective in stimulating marketable yield relative to the control. Also, Hala- El-Sayed, *et al.* [23] indicated that, adding of rice residues (RS) caused significant increases on early yield and total yield weight as compared with the control treatment (without organic fertilization).

Effect of the Interactions Between Irrigation Intervals and Adding Different Organic Sources to the Soil: Concerning to the effect of the interaction between irrigation intervals andaddingsome organic materials of filter cake, bagasse and rice straw enriched or not with effective microorganisms (EM) comparing to the control (without addition any compound) on total yield of eggplantas showing in Table 9. The interaction had significant effects in fruits number/plant, early yield (ton/fed) and total fruit yield (ton/fed) during both seasons. The highest values were recorded from theinteraction between adding of filter cake, bagasse and rice straw enriched by effective microorganisms (EM) with irrigation intervals every 5 days or every 10 days, these results were true in both growing seasons.

Table 7: Effect of the interaction between irrigation intervals and adding some organic sources, i.e., rice straw, some residuals of sugar cane products i.e., Filter cake and bagasse with or without microorganisms (EM) on the fruit characters of eggplants during the two seasons of 2018 and 2019

		Fruit length (cm)		Fruit diameter (cm)		Fresh fruit weight (g)		Dry matter in fruit %	
Treatments		2017	2018	2017	2018	2017	2018	2017	2018
Every 5 days	Filter cake	13.93	16.23	2.20	2.67	41.58	48.62	8.80	8.70
	Filter cake+ EM	14.13	15.80	2.33	2.73	43.61	52.94	9.60	9.15
	Bagasse	14.67	15.23	2.27	2.50	44.77	47.10	8.83	9.35
	Bagasse+ EM	15.27	15.10	2.17	2.63	43.13	47.82	9.60	9.75
	Rice straw	14.53	14.47	2.20	2.53	43.50	44.69	8.77	9.45
	Rice straw+ EM	14.93	14.57	2.37	2.57	43.60	44.74	8.97	9.65
	EM	12.37	13.27	2.53	2.60	41.33	41.83	8.70	9.85
	Control	11.37	13.07	2.30	2.47	35.43	38.78	8.60	9.37
Every 10 days	Filter cake	13.10	14.00	2.40	2.50	40.65	44.94	10.07	9.13
	Filter cake+ EM	13.40	14.83	2.50	2.60	41.04	45.30	9.95	9.33
	Bagasse	14.73	14.77	2.47	2.63	45.90	45.91	9.70	9.95
	Bagasse+ EM	13.63	15.20	2.37	2.63	43.22	44.72	10.80	10.50
	Rice straw	13.77	13.40	2.37	2.47	41.41	42.44	10.53	10.00
	Rice straw+ EM	14.13	13.40	2.57	2.53	43.37	43.59	10.10	10.43
	EM	14.37	12.83	2.30	2.60	41.36	41.41	9.35	9.25
	Control	11.17	11.63	2.30	2.50	34.53	37.58	10.13	10.43
Every 15 days	Filter cake	13.70	14.47	2.50	2.57	41.25	44.52	10.40	9.57
	Filter cake+ EM	14.23	13.900	2.47	2.50	42.37	43.83	10.50	9.63
	Bagasse	13.30	12.400	2.47	2.10	40.12	43.23	10.40	9.93
	Bagasse+ EM	14.23	13.933	2.57	2.30	43.23	44.30	10.47	9.53
	Rice straw	14.33	13.933	2.63	2.47	41.71	43.21	10.85	9.80
	Rice straw+ EM	14.23	16.000	2.60	2.47	41.98	43.19	9.25	9.53
	EM	14.40	11.800	2.400	2.43	40.72	40.31	9.75	9.60
	Control	11.03	12.167	2.33	2.13	33.75	34.27	10.43	10.57
L.S.D at 5% level		0.37	0.222	0.062	0.072	0.482	0.524	0.23	0.257

Table 8: Effect of irrigation eggplant plants by using irrigation intervals and adding some organic sources, i.e., rice straw and some residuals of sugar cane products i.e., filter cake and bagasse with or without (EM) microorganisms on the fruit yield of during the two seasons of 2018 and 2019

	No. of fruits / plant		Early yield Ton/ fed		Total yield Ton/ fed	
Treatments	2018	2019	2018	2019	2018	2019
Irrigation intervals						
Every 5 days	65.943	66.995	3.8227	4.1322	25.860	25.917
Every 10 days	64.370	65.423	3.4537	3.7512	24.238	24.529
Every 15 days	62.202	63.331	3.2590	3.3904	22.027	23.647
L.S.D at 5 % level	0.994	0.134	0.1040	0.1729	0.9579	0.3267
	Adding some organic sources to the soil					
Filter cake	60.113	65.246	3.5880	3.9613	24.430	24.824
Filter cake+ EM	71.011	74.257	3.8458	4.3127	26.400	26.514
Bagasse	64.762	64.579	3.7172	3.8020	25.315	26.322
Bagasse+ EM	70.629	69.431	3.9394	4.0247	27.356	27.385
Rice straw	67.621	67.102	3.5493	3.7543	25.230	26.153
Rice straw+ EM	72.152	72.417	3.7293	3.9150	27.539	27.405
EM	61.174	60.212	3.3127	3.4012	20.233	21.432
Control	45.910	48.754	2.4129	2.8921	15.830	17.547
L.S.D at 5 % level	0.8986	0.8686	0.1043	0.2027	0.8663	0.6955

Similar results were obtained by Pirboneh *et al*. [5] who reported that irrigation of eggplants every 6 days and application of 2 cm mulch per plant results the highest yield with 51.1 ton / ha attributed.

Chemical Sproperties in Eggplant Fruits and Chlorophyll in the Leaves

Effect of Irrigation Interval: Respecting to the nutritional status of eggplant fruits as influenced by three irrigation

Table 9: Effect of the interaction between irrigation intervals and adding some organic sources, i.e., rice straw, some residuals of sugar cane products i.e., Filter cake and bagasse with or without microorganisms (EM) on the yield of eggplant plants during the two seasons of 2018 and 2019

		No. of fruits / plant		Early yield Ton/ fed		Total yield Ton/ fed	
Treatments		2018	2019	2018	2019	2018	2019
Every 5 days	Filter cake	64.111	67.555	3.9240	4.3880	26.935	25.620
	Filter cake+ EM	74.778	75.098	4.0853	4.8780	29.905	27.503
	Bagasse	65.625	66.000	4.1157	4.2900	27.946	27.252
	Bagasse+ EM	72.700	70.830	4.2050	4.3080	29.244	27.911
	Rice straw	64.636	68.125	3.7530	3.9680	27.193	28.160
	Rice straw+ EM	75.778	74.759	3.9120	4.0920	28.202	30.170
	EM	62.229	63.325	3.6680	3.9480	21.112	22.270
	Control	47.687	50.270	2.9187	3.1857	16.344	18.450
Every 10 days	Filter cake	58.654	64.182	3.5280	3.7200	24.216	24.939
	Filter cake+ EM	71.305	75.414	3.8040	4.2950	25.422	26.371
	Bagasse	67.836	65.398	3.7080	3.8520	25.848	26.322
	Bagasse+ EM	70.248	68.578	3.8573	4.1130	28.584	27.753
	Rice straw	69.719	67.950	3.5367	3.6600	25.128	25.530
	Rice straw+ EM	70.238	72.689	3.6880	3.9160	27.876	26.244
	EM	60.873	60.368	3.2760	3.4027	20.832	21.382
	Control	46.083	48.806	2.2320	3.0507	16.000	17.692
Every 15 days	Filter cake	57.575	64.000	3.3120	3.7760	22.140	23.912
	Filter cake+ EM	66.950	72.261	3.6480	3.7650	23.872	25.668
	Bagasse	60.825	62.339	3.3280	3.2640	22.152	25.392
	Bagasse+ EM	68.938	68.886	3.7560	3.6530	24.240	26.490
	Rice straw	68.509	65.232	3.3583	3.6350	23.370	24.768
	Rice straw+ EM	70.440	69.802	3.5880	3.7370	26.538	25.800
	EM	60.420	56.943	2.9940	2.8530	18.756	20.643
	Control	43.961	47.187	2.0880	2.4400	15.147	16.500
L.S.D at 5% level		0.5453	0.5271	0.0633	0.1230	0.5257	0.4221

Table 10: Effect of irrigation eggplant plants by using irrigation intervals and adding some organic sources, i.e., rice straw and some residuals of sugar cane products i.e., filter cake and bagasse with or without (EM) microorganisms on some chemical contents of eggplants fruits during the two seasons of 2018 and 2019

	N %		P %		K %		CHL	
Treatments	2018	2019	2018	2019	2018	2019	2018	2019
Water irrigation intervals								
Every 5 days	2.4369	2.5246	0.5057	0.4769	3.5468	3.2966	55.158	58.255
Every 10 days	2.4488	2.4204	0.4504	0.4495	3.3852	3.0322	61.475	60.428
Every 15 days	2.2996	2.3304	0.4337	0.4164	2.9591	2.8296	62.306	62.295
L.S.D at 5 % level	NS	0.1310	0.0263	0.0451	0.0644	0.2427	0.7975	0.7877
	Adding some organic sources to the soil							
Filter cake	2.3650	2.4167	0.4690	0.4709	3.3634	3.0286	60.889	59.160
Filter cake+ EM	2.5122	2.5033	0.4812	0.4808	3.5298	3.2942	63.667	63.896
Bagasse	2.4800	2.4044	0.4647	0.4533	3.2484	3.0316	59.953	60.557
Bagasse+ EM	2.5944	2.6333	0.5062	0.4992	3.4808	3.1966	62.580	62.367
Rice straw	2.3789	2.5244	0.4802	0.4332	3.4024	3.0417	58.979	63.033
Rice straw+ EM	2.6222	2.6178	0.4900	0.4590	3.6041	3.1671	62.144	65.179
EM	2.1911	2.1733	0.4286	0.4019	2.9074	2.8267	57.867	56.471
Control	2.0167	2.1278	0.3863	0.3824	2.8397	2.8360	51.091	51.946
L.S.D at 5 % level	0.1174	0.1103	0.0319	0.0310	0.1096	0.1796	1.0579	1.1527

Table 11: Effect of the interaction between irrigation intervals and adding some organic sources, i.e., rice straw, some residuals of sugar cane products i.e., filter cake and bagasse with or without microorganisms (EM) on some chemical contents of eggplants fruits during the two seasons of 2018 and 2019

		N %		P %		K %		CHL	
Treatments		2018	2019	2018	2019	2018	2019	2018	2019
Every 5 days	Filter cake	2.305	2.357	0.521	0.531	3.536	3.245	57.66	56.97
	Filter cake+ EM	2.463	2.463	0.543	0.545	3.880	3.456	62.90	65.23
	Bagasse	2.550	2.550	0.492	0.456	3.511	3.243	54.40	57.00
	Bagasse+ EM	2.667	2.797	0.545	0.550	3.803	3.36	57.27	59.70
	Rice straw	2.320	2.650	0.51	0.446	3.624	3.220	51.37	61.30
	Rice straw+ EM	2.723	2.880	0.519	0.463	3.827	3.330	59.23	63.67
	EM	2.290	2.290	0.466	0.414	3.182	3.210	55.33	54.09
	Control	2.177	2.210	0.450	0.410	3.010	3.308	43.10	48.07
Every 10 days	Filter cake	2.560	2.430	0.432	0.450	3.453	2.901	62.53	58.50
	Filter cake+ EM	2.690	2.603	0.445	0.463	3.505	3.406	64.17	62.95
	Bagasse	2.430	2.303	0.470	0.463	3.484	2.951	62.03	60.47
	Bagasse+ EM	2.680	2.557	0.496	0.495	3.606	3.120	64.07	62.77
	Rice straw	2.323	2.460	0.485	0.449	3.433	3.238	62.67	63.40
	Rice straw+ EM	2.660	2.583	0.490	0.492	3.700	3.205	63.10	65.17
	EM	2.217	2.137	0.412	0.402	3.100	2.736	59.70	57.7
	Control	2.030	2.290	0.374	0.383	2.800	2.700	53.53	52.47
Every 15 days	Filter cake	2.230	2.463	0.455	0.432	3.101	2.940	62.48	62.01
	Filter cake+ EM	2.383	2.443	0.456	0.435	3.204	3.020	63.93	63.50
	Bagasse	2.460	2.360	0.432	0.441	2.750	2.900	63.43	64.20
	Bagasse+ EM	2.437	2.547	0.477	0.453	3.033	3.110	66.40	64.63
	Rice straw	2.493	2.463	0.446	0.405	3.150	2.667	62.90	64.40
	Rice straw+ EM	2.483	2.390	0.461	0.422	3.285	2.967	64.10	66.70
	EM	2.067	2.093	0.408	0.39	2.440	2.533	58.57	57.62
	Control	1.843	1.883	0.335	0.354	2.709	2.500	56.64	55.30
L.S.D at 5% level		NS	NS	0.019	0.018	0.067	NS	0.642	0.670

intervals are shown in Table 10 it is noticed that the content of N, P and K in the fruits tissues recorded higher values with irrigation intervals at the shorter regime, i.e. every 5 days with significant varied within the other irrigation treatments. The results were true in both seasons except N% in the first season. This finding could be attributing to the fact that when soil moisture decreased, the mobility of nutrient in the soil is towered down and the rate of nutrients flow to root absorption zone. On the other hand, there were significant affected on leaf chlorophyll contents of eggplant as shownin Table 10 data revealed that, increasing the periodof irrigation led to increase in concentration of chlorophyll in the leaves. Whereasirrigation intervals every 5 day showed the lowest than those irrigated every 10 or 15 day in both seasons.

Effect of Adding Different Organic Sources to the Soil: Chemicals properties in eggplant fruits and chlorophyll in the leaves showed significant results by adding some organic materials i.e., filter cake, bagasse and rice straw enriched or not with effective microorganisms (EM) comparing to control (without addition any compound) in both growing seasons, as shown in Table 10. The data showed that, the treatments of the soil applications of, rice straw 1.5ton/ fed. + EM 3L/ ton or using bagasse at 1.5 ton/ fed. + EM 3 L/ ton or filter cake at 5 ton / fed. + EM 3L/ ton were the best treatments forthe N, P and K content in fruits tissues and chlorophyllin the leaves. These results may be due to this materials considered as source of N, P K and organic matter as shown in Tables 1, 2 and 3 in addition, this materials increases the moisture content of the soil which avoids frequent watering of plantsincreased soil concentrations of organic matter, organic carbon, total nitrogen and available phosphorus. These results are in agreement with those results obtained by El-Bolok [15] on pomegranate trees which indicated that, fertilizing with filter cake at 50 and100% of N eitheralone or with EM and/ or yeast each at 0.2% was considerably effective in stimulating all growth aspects, leaf contents of pigments relative to the control. Also, Hala El-Sayed *et al.* [23] indicated that, rice residues (RS) application at (4 t/fed) caused significant increases on total chlorophyll, N, P and K percentages in eggplant leaves as compared with control treatment (without organic fertilization).

Effect of the Interactions Between Irrigation Intervals and Adding Different Organic Sources to the Soil: The obtained results in Table 11 show that the effect of the interactions among the organic treatments indicated that, adding of Rice strawat 1.5 ton/ fed. + EM 3L/ ton with irrigation every 5 days gave the highest values of N% in both seasons without significant varies with others treatments. While, usingbagasseat 1.5 ton/ fed. + EM 3 L/ ton or filter cake at 5 ton / fed. + EM 3L/ ton with irrigation every 5 days showed significant results forthe content of P and K in fruits tissues in both seasons except P% in the second season. Regardingchlorophyll in the leaves all the treatments which used induced significant effect at 5% level especially adding of rice strawat 1.5ton/ fed. + EM 3L/ ton with irrigation every 10 or 15 days in both season.

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