

Filter mud cake and some natural materials usage to improve growth, yield and chemical constituents of *Capsicum frutescens* L. plants

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ABSTRACT

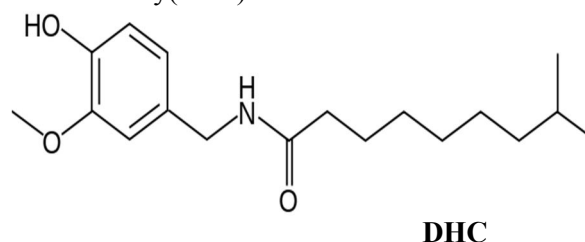
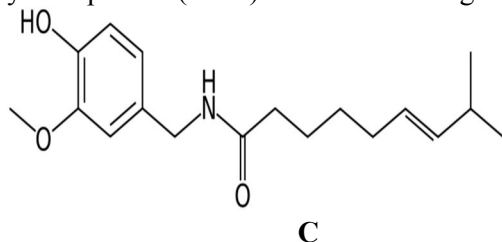
A field experiment was conducted during two successive summer seasons (2014 and 2015) to aims the influence of filter mud cake level (0, 8, 16 and 24 m³/fed) and some natural substances effective microorganisms (EM), Methionin amino acid (ME) and Royal Jelly Queens (RJ) alone or their combinations on growth, yield, alkaloid total capsaicin content, and NPK percentages in Chili Pepper *Capsicum frutescens* L. plants. The obtained data showed that plant height, branch number, fresh shoot , dry weight, pods yield/plant and/fed., total alkaloid capsaicin content and NPK percentages were generally increased as a result of applying filter mud cake recording the highest values at high level (24 m³ /fed.). Also, all the used mixtures used significantly increased plant height, branch number, fresh shoot & dry weight, pods yield/plant and per fed., total alkaloid capsaicin content, N, P and K percentages. The highest values of the previous characteristics were obtained with EM + ME + RJ. Generally, the combined effect among filter mud cake and natural substances on *Capsicum frutescens* L. plants parameters were statistically significant. In most cases, the addition of high rate of filter mud cake plus mixture of natural substances consists of EM + ME + RJ was the most effective treatments in increasing these parameters.

Key words: filter mud cake, natural substances, EM , Methionin amino acid ME and Royal Jelly Queens

Introduction

Chili Pepper (*Capsicum frutescens* L.), an annual herb or shrub with many branches, belongs to the Solanaceae family. The unripe fruits are green or purple in colour but turn red, orange, yellow or brown when ripe (Udoh et al., 2005). It is commonly used as condiments (Alabi, 2006) and the non-pungent species (*Capsicum annum*) are eaten raw as salad while the stronger flavoured types (chilies) are popular in all kinds of cookery as pungent species. It is also used in seasoning sauces and soup and other dishes. As a medicinal plant, pepper is used in the prevention and treatment of cold and fever (Udoh et al., 2005). The very hot varieties of pepper (Chilies) have a high content of the alkaloid capsaicin which imparts the pungency or spicy taste. Pepper like other vegetables crops contributes nutritiously with nutrients that may be lacking in other food materials hence improve food intake (Grubben, 1977).

Chili Pepper pods contain two important types of capsaicin, Capsaicin (C) = 69 % and Dihydrocapsaicin (DHC) = 22 % according to Bennett and Kirby(1968).



Sugar-cane filter mud is considered as a byproduct resulted from sugar industries in a great amount. It represents about 3-4 % of total sugar cane yield, with an estimated amount of about 380 ton/year, derived from 10795000 ton sugar cane/year (statistical year book of A.R.E, 1994). These residues represent a problem in getting disposed. Therefore, it is necessary to use it as an organic fertilizer or soil amendment, since it contains a considerable amounts of N, P, K and micronutrients; Charles (1991), Arafat *et al.*, (1992), Zaid and Kriem (1992), Ahmed *et al.*, (1996), Mansour and Ahmed (1998) and Ali *et al.*, (2002).

Effective microorganisms (EM) as biofertilizer is not expensive and safe in use. It has beneficial effect on agriculture crops and environment. Biofertilizer are low cost, ecofriendly and renewable courses of plant nutrients. In this concern, microorganisms that regiment plant growth via different mechanisms such as biological N-fixation, growth stimulating or hormonal, substances and enhancing the a availability of soil nutrients (Hedga, *et al.*, 1999 and Hauwaka, 2000). EM capable to enhance soil nutritional status, physical, chemical and morphological properties. It plays a vital role in helping plants to grow healthy and strong. Without environment hazardous (Correa, 2002). Kengo and Hui-Lian (2000) observed an improvement in growth, yield and quality of crops, soil health orl quality due to the inoculation of EM cultures to the soil plant ecosystem.

Rare literatures are available about the impact of royal jelly on horticultural crops. It is secreted from the heads of queen bees. It is synthesized from pollens, water and honey mixed with saliva, hormones and vitamins. It contains 65.3 % water and 34.7 % dry matter. The dry matter portion composes from 48.2 % proteins, 37.8 % carbohydrates, 10.4 % lipids and 2 % ash. It is also contains vitamins B1, B2, B5, B6, B8 and B9 as well as vitamin C. It contains at least 17 amino acids, different nutrients (K, Mg, Ca, Fe, P, S, Mn and Si) and gonadotrophic and sex hormones (Nation and Robinson, 1971).

The current study aims to explore the influence of filter mud cake, microorganisms (EM), some natural substances (methionine amino acid and Royal Jelly Queens) and their interactions on vegetative growth, yield , chemical constituents of Chili Pepper (*Capsicum frutescens* L.) plants.

Materials and Methods

An experiment was carried out in a private farm in Aswan Governorate, Egypt, during two successive seasons (2014 and 2015) to study the effect of filter mud cake rates (0, 8, 16 and 24 M³/fed.) and some Natural substances treatments , (Effective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "RJ" half g/ L) alone or in combination on Chili pepper plant trials on (plant height, branches number / plant, fresh and dry shoot weight (g) / plant, pods yield / plant, pods yield /fed. total alkaloid capsaicin content, N P K percentage and dry herb content .

The experimental plot was 2.5 × 3 m containing 4 rows at 60 cm apart with 25 cm hills distances in the row (36 plants/plot). The experimental was split plot design with three replicates. Filter mud cake levels occupied the main plots while natural substances were assigned in the sub plots. Chili Pepper plants were sown an April 1st of the two seasons. Some physical and chemical properties of the field experiment are presented in table (1). Some chemical properties of used filter mud cake are listed in table (2).

The filter mud cake was obtained from Edfou Sugar Cane Factory , Aswan Governorate. The EM was obtained from the Laboratory of biofertilizers, Genetics Depar., Fac. of Agric., El Minia Univ. contain N-fixing bacteria (photosynthetic bacteria) , yeasts , lactic acid bacteria. Each ml EM contains 107 cells of active bacteria. A mixture of 500 ml plus 500 ml water was prepared and applied side dress at rate of 50 ml/plant. Methionine amino acid of ME were obtained from the International Trade Company, Cairo, Egypt and Royal Jelly Queens RJ was obtained from one of the apiary's, Aswan Governorate. ME and RJ were applied as a foliar spray till run off three times at two week intervals starting April. 22nd in both seasons.. All other agricultural practices were performed as usual. The pods were collected from three cut at the fruiting stage , one month intervals starting June, 15th in both seasons.

Nitrogen (N), phosphorus (P) and potassium (K) percentages in the dry herb were determined as follows: N was determined according to the modified micro Kjeldahl method as described by Wildy *et al.* (1985), Phosphorus % was estimated colorimetrically according to the method of

Chapman and Pratt (1975) and Potassium % was determined by Flame-photometer according to Cottenie *et al.* (1982).

All obtained data were statistically analyzed according to Little and Hills, (1978).

Table 1: Some physical and chemical soil properties

Properties	0-30 cm	30-60 cm
Sand (%)	34.02	33.55
Silt (%)	27.98	28.97
Clay (%)	38.00	37.53
Texture	Clay Loam	Clay Loam
CaCO ₃ (%)	3.80	4.55
pH (1:2.5 suspension)	7.85	7.98
EC _e (dS m ⁻¹)	0.38	0.46
Organic matter (g)	2.41	2.25
Available N (mg kg ⁻¹)	68.2	65.4
Available Olsen P (mg kg ⁻¹)	12.78	14.32
Available K (mg kg ⁻¹)	298.1	466.4

Each value represents a mean of three replicates.

Table 2: Chemical analysis of filter mud cake (FMC)

C/N	O.M.	N	P	K	Fe	Zn	Mn	Cu	EC (ds/m)	pH
%					ppm					
1 :0.35	1	2.4	2.1	0.64	5000	123	310	185	5	6.2

Results and Discussion

Vegetative growth:

Plant height:

Data presented in Table (3) revealed that plant height of Chili Pepper *Capsicum frutescens* L. plants was significantly influenced by filter mud cake treatments in the two experimental seasons. From the obtained results it could be noticed that by increasing the rates of filter mud used, the plant height was augmented therefore, the tallest plants were obtained due to receiving the plants high rate of filter mud cake which increased the plant height by 60.65 and 52.68 % over the check treatment in the first and second seasons, respectively. The role of filter mud on increasing plant height was previously mentioned by Ali *et al* (2002), Mohamed and Ahmed (2002) and Hassan *et al.*, (2010).

As for natural substances treatments, data in Table (3) showed that all of them caused a significant increase in plant height of Chili Pepper (*Capsicum frutescens* L) in both seasons.

Adding with a mixture of affective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." half gm/ L) gave the best results of plant height in comparison with untreated ones in the two consecutive seasons. This above concentration used reached 62.63 and 45.61 % over the control plants in the two growing seasons, respectively.

Concerning the interaction effect between filter mud and mixture of natural substances treatments, it was significant on plant height of Chili Pepper.in the two successive seasons. It seems that the most effective treatments of plant height were observed when fertilizing the plants with Filter mud at the high rate plus Adding with a mixture of Effective microorganisms "EM" 500 ml /L, Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." (half gm/ L) followed by mixture of Effective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm compared to other combination treatments in the first and the second seasons, as clearly declare in (Table 3).

Number of Branches:

Results is table (3) indicate that supplying Chili Pepper *Capsicum frutescens* L. plants with filter mud cake at all rates led to a significant augment in branch number for the two seasons. It is

clear that number of branch were significantly increased by increasing the rates of filter mud used. Therefore, utilizing of the high rate of filter mud recorded highest number of branches recorded 61.87 and 56.44 % than two experimental seasons, respectively.

In regard to natural substances treatments data in Table (3) pointed out that branch number of Chili Pepper was significantly influenced by all Adding with a mixture of Effective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." half gm/ L) in the two growing seasons. The data reveal that mixture of Effective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." half gm/ L) gave maximum number of branches which increased it by 68.32 and by 61.06 % over the control treatment in the first and the second seasons, respectively.

The combined between the two factors on branch number of Chili Pepper *Capsicum frutescens* L. had significant for the obtained results , it is noted that treating the plants with filter mud at mixture of Effective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." half gm/ L) recorded better results of branch number of Chili Pepper *Capsicum frutescens* L. in comparison with other treatments in both seasons, as clearly shown in Table (3).

Table 3: The influence of Filter mud cake (FMK) fertilization and some natural substances treatments on plant height (cm) & branch number of *Capsicum frutescens* L. plants during the seasons of 2014 and 2015.

Natural substances treatments (B)	Filter mud cake M ³ /fed (A)												
	First season					Second season							
	Plant height (cm)												
	0	8	16	24	Mean	0	8	16	24	Mean			
Control	52.11	55.55	68.22	87.77	65.91	58.44	61.33	92.22	93.44	76.36			
EM	66.66	69.44	101.66	106.66	86.11	70.33	72.44	106.55	104.66	88.50			
ME	63.55	65.55	105.33	107.88	85.58	73.00	78.77	110.33	111.11	93.30			
RJ	75.33	82.22	109.33	112.44	94.83	79.55	87.22	113.22	116.22	99.05			
EM+ME	72.22	93.55	119.11	121.44	101.58	83.77	98.89	122.00	127.22	107.97			
EM+RJ	71.22	87.22	111.44	114.44	96.08	75.99	92.55	115.88	118.00	100.61			
ME+RJ	67.66	76.22	110.44	113.33	91.91	71.77	90.00	114.55	117.00	98.33			
EM+ME+RJ	84.22	97.77	122.44	124.33	107.19	84.66	103.33	126.55	130.22	111.19			
Mean	69.12	78.44	106.00	111.04		74.69	85.56	112.66	114.04				
L.S.D. for 5%	A:3.83		B:5.17		AB:10.34		A:1.52		B:1.19		AB:2.39		
Natural substances treatments (B)	Branch number/plant												
	Control	2.330	2.663	2.887	3.330	2.803	2.663	3.330	3.663	3.997	3.413		
	EM	2.663	3.217	3.440	4.663	3.496	3.550	3.887	4.550	5.550	4.384		
	ME	2.997	3.440	4.110	4.883	3.858	3.440	4.330	4.663	5.330	4.441		
	RJ	3.330	3.663	4.330	5.110	4.108	3.663	4.663	4.997	5.550	4.718		
	EM+ME	3.550	3.773	4.550	5.440	4.328	3.887	4.777	5.217	5.997	4.969		
	EM+RJ	3.110	3.663	4.440	5.220	4.108	3.660	4.663	4.887	5.660	4.718		
	ME+RJ	3.330	3.773	4.553	5.660	4.329	3.773	4.663	4.997	5.887	4.830		
	EM+ME+RJ	3.660	4.330	4.773	6.110	4.718	4.110	5.330	5.550	6.997	5.497		
	Mean	3.121	3.565	4.135	5.052		3.593	4.455	4.815	5.621			
	L.S.D. at 5%	A:0.156		B:0.130		AB:0.259		A:0.142		B:0.133		AB:0.266	

Shoot fresh and dry weight:

Shoot fresh and dry weight of Chili Pepper *Capsicum frutescens* L. was significantly affected by utilizing of filter mud in the two seasons. The obtained data indicate that by increasing the rates of filter mud the Shoot fresh and dry weight was significant augmented in the two consecutive seasons. Therefore, receiving Chili Pepper *Capsicum frutescens* L. the high rate of filter mud produced heaviest herb fresh and dry weight and ranged 24.07 & 25.45 and 22.93 & 24.91 % over the check treatment in the two growing seasons, respectively, as clearly reveal in Table (4). The promoting effect of filter mud on enhancing plant growth was reported by Ali *et al.* (2002), Mohamed and Ahmed (2002) Hassan *et al.* (2010).

Data illustrated in Table (4) shows that all natural substances treatments significantly augmented shoot fresh and dry weight of Chili Pepper in the two seasons. It was found that the highest Shoot fresh and dry weight was obtained due to treating the plants with the with a mixture of Effective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." half gm/ L. as increased it by 43.06 & 73.92 and by 43.82 & 43.11 % over untreated ones in both seasons, respectively.

With respect to the interaction between filter mud and natural substances treatments on herb dry weight of Chili Pepper *Capsicum frutescens* L. was significant effect for the two successive seasons. It is clear that the most effective treatments was observed when fertilizing the plants with filter mud at the high rate and mixture at natural substances in comparison with other combination treatments in the two experimental seasons, as shown in Table (4).

Table 4: The influence of Filter mud cake (FMK) fertilization and some natural substances treatments on Shoot fresh & dry weight (g) of *Capsicum frutescens* L. plants during the seasons of 2014 and 2015.

Natural substances treatments (B)	Filter mud cake M ³ /fed (A)											
	First season					Second season						
	Shoot fresh weight (g)											
	0	8	16	24	Mean	0	8	16	24	Mean		
Control	202.7	221.7	235.7	251.0	227.8	235.7	237.7	255.3	281.0	252.4		
EM	248.3	265.3	292.3	308.7	278.7	271.7	282.0	309.0	350.7	303.3		
ME	235.3	254.7	278.7	267.3	259.0	261.0	276.3	295.7	301.7	283.7		
RJ	241.3	261.0	287.7	291.3	270.3	267.0	278.3	301.0	306.0	288.1		
EM +ME	266.0	367.3	313.3	340.0	296.7	293.0	287.0	313.3	377.7	317.8		
EM+RJ	274.0	279.3	336.0	356.0	311.3	302.3	302.0	356.3	394.3	338.8		
ME+RJ	258.3	272.7	322.3	326.7	295.0	285.7	293.0	343.0	370.7	323.1		
EM+ME+RJ	298.0	303.3	332.0	370.3	325.9	318.7	327.7	324.0	422.0	348.1		
Mean	253.0	265.7	299.8	313.9		279.4	285.5	312.2	350.5			
L.S.D. for 5%	A:6.4			B:5.1		AB: 10.1		A:5.2		B:2.7		AB:5.5
Natural substances treatments (B)	Shoot Dry weight (g)											
	Control	60.67	63.67	67.67	72.00	66.00	67.33	68.67	73.67	80.67	72.58	
	EM	72.33	75.67	84.00	88.33	80.08	79.00	82.00	89.00	100.67	87.67	
	ME	67.67	73.00	80.33	76.33	74.33	75.00	80.00	84.67	86.33	81.50	
	RJ	69.67	74.67	83.00	83.67	77.75	77.00	82.33	86.67	87.67	83.42	
	EM +ME	76.67	77.00	89.67	97.33	85.17	84.33	84.33	89.33	107.67	91.24	
	EM+RJ	78.67	80.00	96.33	102.33	89.33	86.67	87.33	101.67	114.00	97.42	
	ME+RJ	74.00	77.67	92.33	93.33	84.33	82.33	84.00	98.67	106.00	92.75	
	EM+ME+RJ	86.00	87.33	99.67	106.67	94.92	92.00	95.00	107.33	121.00	103.83	
	Mean	73.21	76.13	86.63	90.00		80.46	82.96	91.38	100.50		
	L.S.D. at 5%	A: 1.52			B:0.99		AB: 1.98		A:1.53		B:0.90	

Yield Parameters:

Pods yield per plant (g) & per fed. (kg) :

Data recorded in Table (5) indicate that the main effect of filter mud treatments on pods yield per plant & per fed. of Chili Pepper *Capsicum frutescens* L. was statistically significant in the two growing seasons. From the obtained results it could be noticed that by increasing the rates of filter mud the pods yield per plant & per fed. was significantly augmented. Therefore, the maximum value of pods yield per plant & per fed. was observed when receiving the plants high rate of filter mud as ranged 152.39 & 91.26 and 155.05 & 90.68 than the check treatment in the first and second seasons, respectively. It is worthy that all mixture at natural substances led to a significant increase in pods yield per plant & per fed. in the two consecutive seasons. It was found that the highest value of pods yield per plant & per fed. was detected due to treating

Chili Pepper. plants with a mixture of Effective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." half gm/ L. which increased it over unsprayed control by 172.57 % & 159.65% and by 171.74 % & 161.33 in the two seasons, respectively, as clearly reveal in Table (5).

The interaction effect between the two factors on pods yield per plant & per fed. of Chili Pepper. was significant for the hath seasons. The most effective treatment was obtained when receiving the plants the high rate of filter mud plus mixture of Effective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." half gm/ L. compared to other treatments in the two seasons, as clearly illustrated in Table (5).

Table 5: The influence of Filter mud cake (FMK) fertilization and some natural substances treatments on pods yield/ of *Capsicum frutescens* L. plants during the seasons of 2014 and 2015.

Natural substances treatments (B)	Filter mud cake M ³ /fed (A)											
	First season					Second season						
	Pods yield /plant (g)											
	0	8	16	24	Mean	0	8	16	24	Mean		
Control	12.00	14.00	18.00	20.33	16.08	12.89	18.33	19.67	22.67	18.39		
EM	16.00	27.33	40.00	46.00	32.33	26.33	32.33	41.67	48.67	37.25		
ME	16.33	28.00	33.67	38.67	29.17	26.33	33.33	35.33	42.33	34.33		
RJ	17.67	29.00	35.33	44.33	31.58	26.67	33.67	39.33	46.33	36.50		
EM +ME	21.33	32.00	49.00	53.00	38.83	29.33	36.00	51.33	57.33	43.50		
EM+RJ	19.00	27.33	44.67	49.00	35.00	26.67	30.67	45.00	54.00	39.08		
ME+RJ	20.33	30.33	47.00	51.67	37.33	28.33	32.33	49.00	56.00	41.42		
EM+ME+RJ	23.00	32.00	55.67	64.67	43.83	30.33	34.67	57.67	68.33	47.75		
Mean (A)	18.21	27.50	40.42	45.96		25.86	31.42	42.38	49.46			
L.S.D. for 5%	A:1.65			B:1.06		AB:2.13		A:1.72		B:1.01		AB:2.02
Natural substances treatments (B)	Pods yield /fed. (kg)											
	First season					Second season						
	Pods yield /fed. (kg)											
	0	8	16	24	Mean	0	8	16	24	Mean		
Control	240.0	280.0	360.0	406.7	321.7	253.3	373.3	393.3	446.7	366.7		
EM	320.0	546.7	800.0	920.0	646.7	526.7	646.7	826.7	973.3	743.3		
ME	333.3	560.0	686.7	773.3	588.3	533.3	666.7	706.7	846.7	688.3		
RJ	346.7	580.0	713.3	886.7	631.7	540.0	673.3	786.7	926.7	731.7		
EM +ME	426.7	640.0	980.0	1060.0	776.7	586.7	720.0	1026.7	1140.0	868.3		
EM+RJ	380.0	546.7	773.3	980.0	670.0	533.3	613.3	900.0	1080.0	781.7		
ME+RJ	406.7	606.7	940.0	1033.3	746.7	566.7	653.3	980.0	1120.0	830.0		
EM+ME+RJ	430.0	660.0	1113.3	1293.3	874.2	606.7	700.0	1153.3	1373.3	958.3		
Mean	360.4	552.5	795.8	919.2		518.3	630.8	846.7	988.3			
L.S.D. at 5%	A:42.4			B:37.4		AB:74.8		A:34.8		B:20.0		AB:39.9

Chemical Constituents:

Total Capsaicin (ug/g):

Data presented in Table (6) reveal that filter mud treatments significantly influenced on total capsaicin (ug/g) of Chili Pepper *Capsicum frutescens* L. in the two experimental seasons. It is appear that all rates of filter mud led to a significant increase in total capsaicin (ug/g) in both seasons. However, the maximum value of total capsaicin (ug/g) was obtained due to addition of filter mud at the high rate as ranged 57.19 and 53.78 % over untreated ones in the first and the second seasons, respectively

Table 6: The influence of Filter mud cake (FMK) fertilization and some natural substances treatments on total Capsaicin (ug/g) of *Capsicum frutescens* L. plants during the seasons of 2014 and 2015

Natural substances treatments (B)	Filter mud cake M ³ /fed (A)											
	First season					Second season						
	Total Capsaicin (ug/g)											
	0	8	16	24	Mean	0	8	16	24	Mean		
Control	897.2	1082.4	1260.9	1448.2	1172.2	908.7	1095.8	1284.4	1457.1	1186.5		
EM	954.5	1142.1	1326.8	1497.5	1230.2	975.7	1159.8	1334.5	1510.6	1245.2		
ME	916.0	1115.1	1295.9	1466.6	1198.4	941.9	1133.2	1306.2	1485.3	1216.7		
RJ	955.8	1125.8	1308.2	1481.7	1217.9	960.4	1139.8	1317.5	1498.1	1229.0		
EM +ME	989.5	1178.7	1358.0	1534.5	1265.2	1040.4	1193.6	1366.2	1544.2	1286.1		
EM+RJ	1009.3	1187.3	1377.2	1556.0	1282.4	1030.4	1203.9	1385.9	1568.4	1297.2		
ME+RJ	973.0	1161.8	1331.1	1535.8	1250.4	991.9	1177.0	1341.4	1547.9	1264.6		
EM+ME+RJ	1028.5	1212.4	1406.3	1620.8	1317.0	1045.6	1225.4	1419.4	1641.1	1332.9		
Mean	965.5	1150.7	1333.1	1517.7		986.9	1166.1	1344.4	1531.5			
L.S.D. at 5%	A:6.6			B:6.0		AB:12.0		A:6.4		B:9.1		AB:18.3

Regarding natural substances treatments, data in Table (6) shows that it was significant effect on total capsaicin (ug/g) of Chili Pepper *Capsicum frutescens* L. in the two consecutive seasons. Adding of mixture of Effective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." half gm/ L. of it gave maximum value of total capsaicin (ug/g) as ranged 12.36 and 12.34 % than the control in the two successive seasons, respectively.

According to the interaction between the two factors on total capsaicin (ug/g) of Chili Pepper *Capsicum frutescens* L. had significant effect in the two experimental seasons. The most effective treatments was detected due to treating the plants with filter mud at the high rate in combination with

of mixture of Effective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." half gm/ L. compared to other treatments in the two seasons, as clearly reveal in Table (6).

Nitrogen, Phosphorus and Potassium Percentages:

Data recorded in Table (7) reveal that nitrogen, phosphorus and potassium percentages of Chili Pepper *Capsicum frutescens* L. was significantly affected by filter mud treatments in the two experimental seasons. It is obvious that all rats of filter mud significantly augmented nitrogen, phosphorus and potassium percentages in the two seasons. However, the maximum values of the three elements (N,P and K) percentages was obtained due to receiving the plants filter mud at the high rate in the two seasons. This above rate of filter mud increased nitrogen percentage by 7.85 and by 10.79 %, also increased phosphorus percentage by 40.77 and by 41.42 % and increased potassium percentage by 25.19 and by 25.70 over untreated ones in the two seasons, respectively.

Table 7: The influence of Filter mud cake (FMK) fertilization and some natural substances treatments on nitrogen, phosphorus and potassium percentages of *Capsicum frutescens* L. plants during the seasons of 2014 and 2015.

Natural substances treatments (B)	Filter mud cake M ³ /fed (A)													
	First season					Second season								
	Nitrogen percentage					Phosphorus percentage								
	0	8	16	24	Mean	0	8	16	24	Mean				
Control	1.697	1.733	1.760	1.803	1.748	1.730	1.763	1.803	1.853	1.788				
EM	1.833	1.880	1.897	1.943	1.888	1.900	1.933	1.973	2.037	1.961				
ME	1.793	1.837	1.860	1.887	1.844	1.833	1.890	1.917	1.980	1.905				
RJ	1.807	1.863	1.887	1.917	1.868	1.873	1.910	1.950	2.000	1.933				
EM+ME	1.850	1.897	1.923	1.990	1.915	1.917	1.980	2.020	2.080	1.999				
EM+RJ	1.877	1.947	1.990	2.060	1.968	1.943	2.003	2.073	2.150	2.043				
ME+RJ	1.823	1.923	1.950	2.000	1.924	1.860	1.920	2.043	2.113	1.984				
EM+ME+RJ	1.897	1.983	2.033	2.120	2.008	1.983	2.057	2.110	2.207	2.089				
Mean	1.822	1.883	1.913	1.965		1.880	1.932	1.986	2.053					
L.S.D. at 5%	A:0.028			B:0.017		AB:0.031		A:0.028			B:0.017		AB:0.033	
	Potassium percentage													
Control	0.167	0.197	0.220	0.273	0.217	0.180	0.210	0.233	0.313	0.234				
EM	0.257	0.280	0.313	0.367	0.304	0.270	0.287	0.330	0.377	0.316				
ME	0.230	0.260	0.293	0.343	0.282	0.240	0.263	0.293	0.353	0.288				
RJ	0.240	0.270	0.307	0.357	0.293	0.257	0.277	0.303	0.363	0.300				
EM+ME	0.280	0.313	0.330	0.383	0.327	0.287	0.320	0.340	0.390	0.334				
EM+RJ	0.300	0.333	0.347	0.397	0.344	0.300	0.343	0.360	0.410	0.353				
ME+RJ	0.287	0.303	0.320	0.370	0.320	0.290	0.310	0.323	0.373	0.324				
EM+ME+RJ	0.317	0.350	0.377	0.437	0.370	0.323	0.357	0.393	0.450	0.381				
Mean	0.260	0.288	0.313	0.366		0.268	0.296	0.322	0.379					
L.S.D. at 5%	A:0.035			B:0.005		AB:0.010		A: 0.007			B: 0.006		AB: 0.12	
	Potassium percentage													
Control	2.790	3.167	3.567	3.717	3.310	2.903	3.290	3.667	3.800	3.415				
EM	3.173	3.650	3.950	4.100	3.718	3.180	3.750	4.017	4.133	3.770				
ME	2.920	3.483	3.717	3.933	3.513	3.060	3.620	3.767	4.017	3.616				
RJ	3.057	3.553	3.767	3.990	3.592	3.100	3.683	3.833	4.067	3.671				
EM+ME	3.347	3.793	4.017	4.150	3.827	3.453	3.817	4.077	4.200	3.887				
EM+RJ	3.503	3.933	4.067	4.233	3.934	3.557	4.000	4.150	4.237	3.986				
ME+RJ	3.367	3.667	3.850	4.043	3.732	3.450	3.750	3.933	4.117	3.813				
EM+ME+RJ	3.660	4.080	4.183	4.333	4.064	3.730	4.143	4.233	4.650	4.189				
Mean	3.227	3.666	3.890	4.063		3.304	3.757	3.960	4.153					
L.S.D. at 5%	A:0.062			B:0.031		AB:0.061		A:0.060			B:0.038		AB:0.075	

As for natural substances treatments, data in Table (7) shows that nitrogen, phosphorus and potassium percentage of Chili Pepper *Capsicum frutescens* L. was significantly affected by these treatments in both seasons. From the obtained results, it could be noticed that all of them significantly augmented the three elements (N, P and K) percentages, Adding of mixture of Effective microorganisms "EM" 500 ml /L, Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." half gm/ L. of it gave maximum value of three elements (N, P and K) percentages as ranged nitrogen percentage by 14.87 and by 16.83 %, also increased phosphorus percentage by 70.51 and by

62.82 % and increased potassium percentage by 22.78 and by 22.66 over untreated ones in the two seasons, respectively.

The interaction effect between filter mud and natural substances treatments on the three elements (N, P and K) percentages had significant in both seasons, The most effective treatment of the three elements (N, P and K) percentages was detected due to treating Chili Pepper *Capsicum frutescens* L. with filter mud at the high rate and mixture of Effective microorganisms "EM" 500 ml /L , Methionine amino acid "ME" 100 ppm and Royal Jelly Queens "R.J." half gm/ L. at the high concentration in comparison with other combination treatments in the two experimental seasons, as clearly reveal in Table (7).

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