RESULTS AND DISCUSSION

4- RESULTS AND DISCUSSION

4.1. Vegetative growth

4. 1. 1. Plant height

The data in Table (3 & 4) and Fig (1 & 2) show clearly that, the plant height was significantly increased as a result of inoculation with different kinds of fertilizers in the two cuts in the two experimental seasons in comparison with the control without fertilizers applications. The fertilization with 50% of (Nitrobein, Phosphatein, potassiumag) and 50% of (ammonium nitrate, calcium super phosphate and potassium sulphate) gave the mostly taller *Mentha piperita* L. Plants in comparison with other treatments of fertilization and the control on the two cuts in the two growing seasons. The differences among the investigated treatments were significant in the most cases.

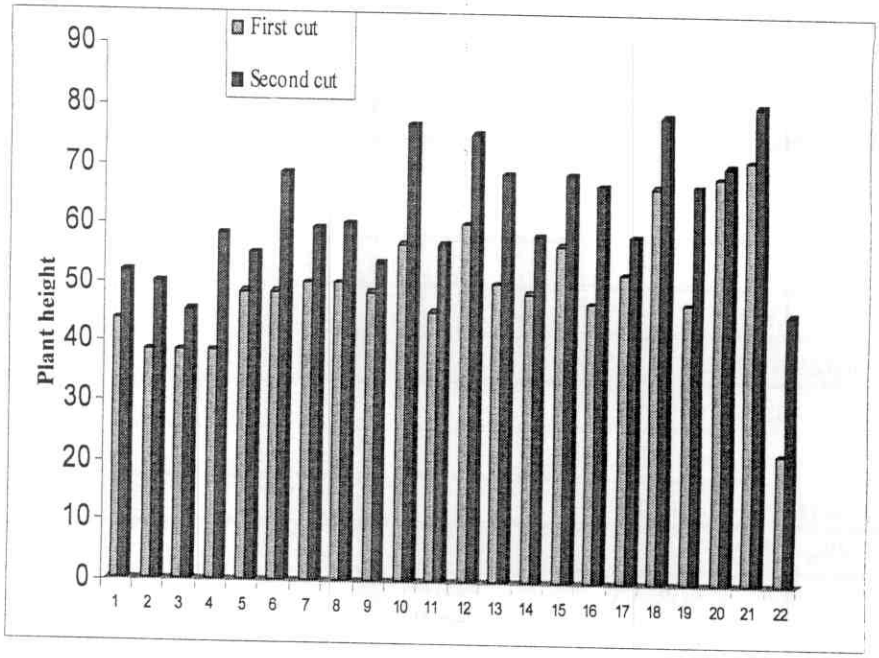
In addition, using 50% of biofertilizer with so for chemical fertilizer gave generally taller plants than those obtained by any other fertilizers and control. While application by 50% nitrobein and 50% ammonium nitrate gave the next result in this connection. The increase in plant height as a result of using different biofertilizers in this investigation could be explained through their providing the plant with nitrogen doses needed for protein and cytokinine synthesis and consequently enhancing cell division **(Wagner and Michael, 1971)**. There results are in accordance with those obtained by **kandeel *et al.*, (2002)** on *Ocimum basilicum*, **Kandeel and Sharaf (2003)** on *Marjorana hortensis* and **Dewidar (2007)** on *Rosmarinus*

Table (3): Effect of mineral, organic and biofertilization on plant height of *Mentha pipperita , L* in the first season during (2006 / 2007).

Treatments	First season	
	First cut	Second cut
Nitrobein	43.3	51.6
Phosphatein	38.3	50.0
Potaassiumag	38.3	45.0
Ammonium nitrate	38.3	58.3
Calcium super phosphate	48.3	55.0
Potassium sulphate	48.3	68.3
100% Bioas	49.8	59.3
50% Nitr. + 50% N	50.0	60.0
50% Phos. + 50% P	48.3	53.3
50% Pota. + 50% K	56.6	76.6
50% Nitr. + 50% Bio.	45.0	56.6
50% Phos. + 50% Bio.	60.0	75.0
50% Pota. + 50% Bio.	50.0	68.3
50% N + 50% Bio.	48.3	58.3
50% P+ 50% Bio.	56.6	68.3
50% K+50% Bio.	46.6	66.6
75% Bio + 25% N	51.6	58.3
75% Bio + 25% P	66.3	78.3
75% Bio + 25% K	46.6	66.6
100% (N + P + K)	68.0	70.0
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	70.9	80.1
Control (with out any fertilizers)	41.6	45.0
L . S . D at 5%	4.9	3.8

Table (4): Effect of mineral, organic and biofertilization on plant height of *Mentha pipperita, L* in the second season during (2007 / 2008)

Treatments	Second season	
	First cut	Second cut
Nitrobein	40.2	45.1
Phosphatein	43.3	48.3
Potaassiumag	30.0	45.2
Ammonium nitrate	33.5	50.3
Calcium super phosphate	50.0	56.6
Potassium sulphate	33.3	43.3
100% Bioas	42.1	51.3
50% Nitr. + 50% N	43.3	45.7
50% Phos. + 50% P	50.0	56.6
50% Pota. + 50% K	55.0	69.3
50% Nitr. + 50% Bio.	45.0	60.2
50% Phos. + 50% Bio.	43.3	65.1
50% Pota. + 50% Bio.	40.0	60.6
50% N + 50% Bio.	46.3	66.6
50% P+ 50% Bio.	50.1	70.2
50% K+50% Bio.	51.6	70.3
75% Bio + 25% N	41.6	55.7
75% Bio + 25% P	55.2	69.4
75% Bio + 25% K	45.4	65.3
100% (N + P + K)	50.9	65.1
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	50.3	75.7
Control (without any fertilizers)	20.2	45.3
L . S . D at 5%	3.7	4.5



Treatment

Fig. (1): Effect of mineral, organic and biofertilization on plant height of *Mentha pipperita* , *L* in the first season during (2006 / 2007).

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)

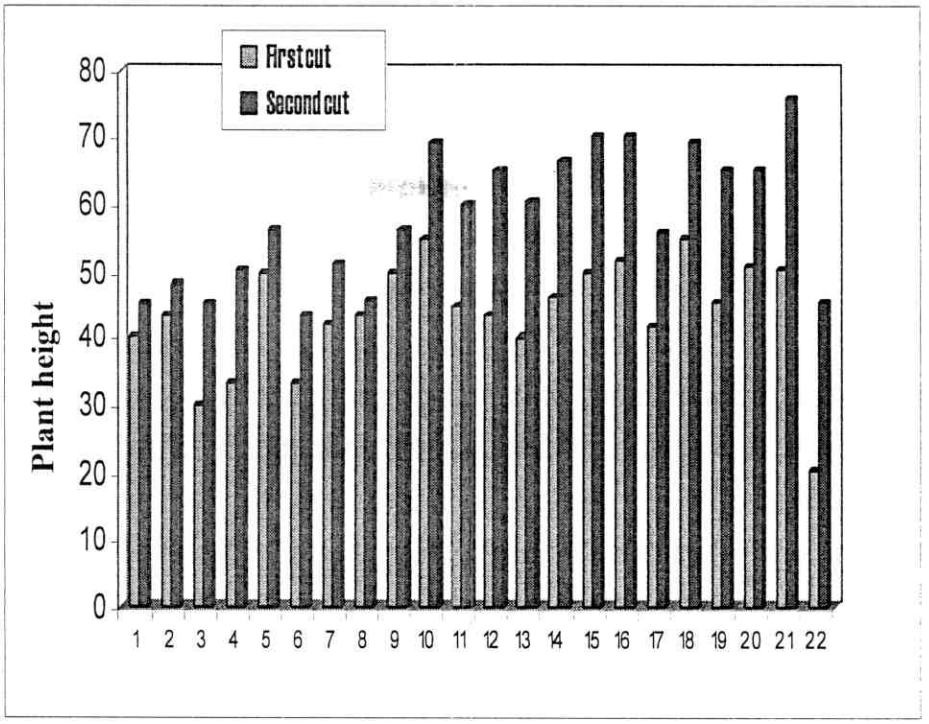


Fig. (2): Effect of mineral, organic and biofertilization on plant height of *Mentha pipperita, L* in the second season during (2007 / 2008)

1. Nitr. 2. Phos. 3. Pota.

4. N 5. P 6. K

7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P

10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.

12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.

14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.

16. 50% K+50% Bio. 17. 75% Bio + 25% N

18. 75% Bio + 25% P 19. 75% Bio + 25% K

20. 100% (N + P + K)

21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)

22. Control (without any fertilizers)

offcinalis, *Mentha virdis* L. and *Origanum majorana* who found that, the plant height was improved as a result of using biofertilization. In general the tallest plant for all treatments were obtained in second cut in comparison with first cut in the two growing seasons. Table (3 & 4).

4. 1. 2. Number of branches per plant

Data in Tables (5 & 6) and Fig (3 & 4) indicate clearly that, the mean number of branches per plant was significantly increased as a result of fertilization with the different kind of fertilization (bio, Organic and chemical) in the two harvesting cut in comparison with control plants grown without fertilization in the two experimental seasons. The fertilization treatment with 50% Nitrobein and 50% biogas resulted in significantly in the most cases more branches per plant in the two cuts than those with another applications. On the other hand using 50% of (nitrobein, phosphatein, potassiumage) and 50% of (ammonium sulphate, super phosphate calcium, sulphate potassium) gave the next value in this concern in both seasons.

The effective role of the application of biofertilization in increasing the mean number of branches per plant could be explained through the interpretation of **Youssef *et al.*, (2004)** on sage plants, who stated that the inoculation with microorganisms which cause an increase in the eudogenous phytohormones such as GA_3 , IAA and cytokinins and consequently stimulating cell division and building more vascular tissues. Further more the finding of several investigators may be support the previously mentioned results **Maheshwari *et al,* (1991)** on lemon grass, **Paramagure and Natarajan (1995)** on *Capsicum annum*,

Table (5): Effect of mineral, organic and biofertilization on number of branches of *Mentha pipperita, L* in the first season during (2006 / 2007).

Treatments	First season	
	First cut	Second cut
Nitrobein	60.0	80.0
Phosphatein	50.0	72.6
Potaassiumag	53.3	66.6
Ammonium nitrate	71.6	93.3
Calcium super phosphate	63.3	86.0
Potassium sulphate	70.0	89.3
100% Bioas	72.3	90.1
50% Nitr. + 50% N	86.6	131.0
50% Phos. + 50% P	63.3	83.3
50% Pota. + 50% K	80.0	90.0
50% Nitr. + 50% Bio.	123.3	163.3
50% Phos. + 50% Bio.	83.3	103.0
50% Pota. + 50% Bio.	80.0	106.0
50% N + 50% Bio.	101.6	121.6
50% P+ 50% Bio.	86.6	113.3
50% K+50% Bio.	90.0	106.6
75% Bio + 25% N	100.0	110.0
75% Bio + 25% P	76.3	91.6
75% Bio + 25% K	83.3	100.0
100% (N + P + K)	110.0	130.0
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	110.0	140.0
Control	43.3	53.3
L .S .D at 5%	8.97	10.26

Table (6): Effect of mineral, organic and biofertilization on number of branches of *Mentha pipperita, L.* in the second season during (2007 / 2008).

Treatments	Second season	
	First cut	Second cut
Nitrobein	63.3	80.0
Phosphatein	53.3	69.3
Potaassiumag	53.3	64.0
Ammonium nitrate	80.0	109.0
Calcium super phosphate	76.3	105.0
Potassium sulphate	76.6	98.6
100% Bioas	72.3	96.1
50% Nitr. + 50% N	110.0	140.0
50% Phos. + 50% P	76.3	104.0
50% Pota. + 50% K	86.6	110.0
50% Nitr. + 50% Bio.	123.8	151.9
50% Phos. + 50% Bio.	103.0	123.3
50% Pota. + 50% Bio.	90.0	130.0
50% N + 50% Bio.	110.0	143.3
50% P+ 50% Bio.	103.0	126.6
50% K+50% Bio.	106.6	123.3
75% Bio + 25% N	106.6	121.6
75% Bio + 25% P	83.3	108.0
75% Bio + 25% K	86.6	113.3
100% (N + P + K)	100.0	120.0
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	90.0	110.0
Control	45.3	56.6
L .S .D at 5%	7.96	9.12

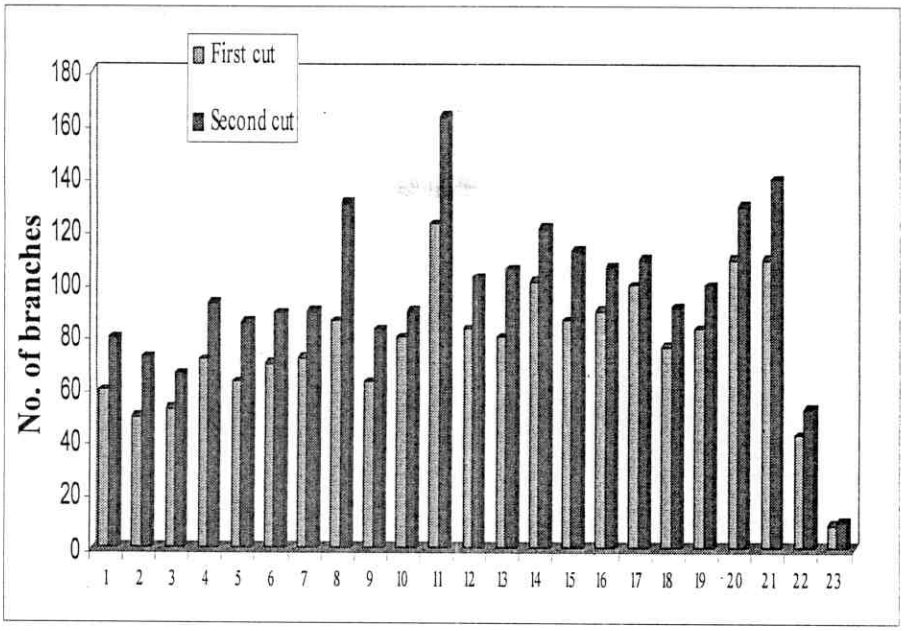


Fig. (3): Effect of mineral, organic and biofertilization on number of branches of *Mentha pipperita, L* in the first season during (2006 / 2007).

1. Nitr. 2. Phos. 3. Pota.

4. N 5. P 6. K

7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P

10. 50% Pota. + 50% K 11. 50% Nitr. + 50% Bio.

12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.

14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.

16. 50% K+50% Bio. 17. 75% Bio + 25% N

18. 75% Bio + 25% P 19. 75% Bio + 25% K

20. 100% (N + P + K)

21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)

22. Control (without any fertilizers)

23. L.S.D. 5%

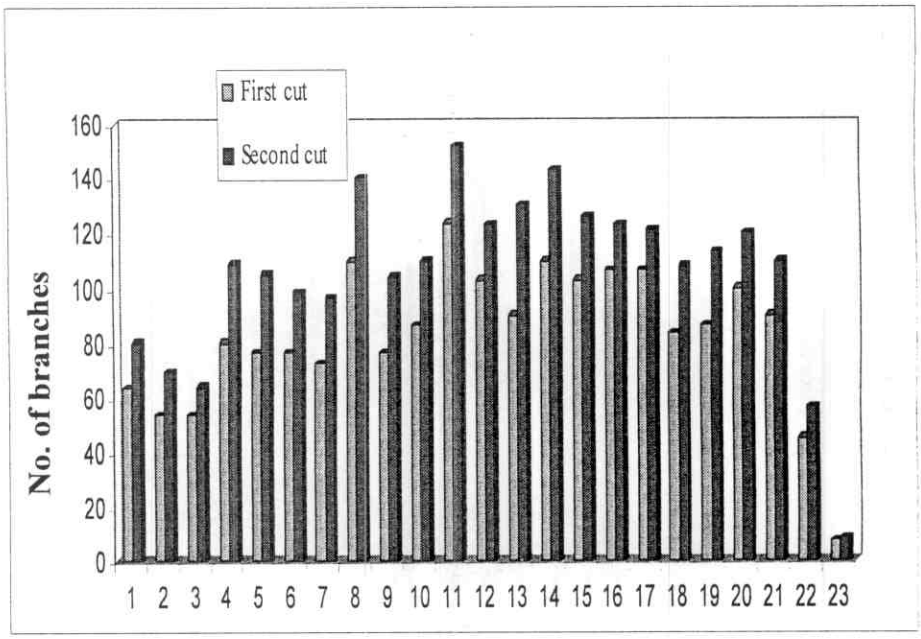


Fig. (4): Effect of mineral, organic and biofertilization on number of branches of *Mentha pipperita, L.* in the second season during (2007 / 2008).

1. Nitr. 2. Phos. 3. Pota.

4. N 5. P 6. K

7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P

10. 50% Pota. + 50% K 11. 50% Nitr. + 50% Bio.

12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.

14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.

16. 50% K+50% Bio. 17. 75% Bio + 25% N

18. 75% Bio + 25% P 19. 75% Bio + 25% K

20. 100% (N + P + K)

21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)

22. Control (without any fertilizers)

23. L.S.D. 5%

Abd-El-latif *et al* (2002) on Matricaria Chamomilla and **Afify (2002)** on fennel plants, who stated also the same trend.

4. 1. 3. Number of leaves per plant

Means of *Mentha piperita* number of leaves per plant as affected by different treatments of fertilizers in the two seasons (2006/ 2007 and 2007/2008) of study were presented in Tables (7 & 8) and Fig (5 & 6).

Data in Table (7 & 8) showed that number of leaves per plant was significantly affected by the studied organic, mineral and biofertlizer treatments in both seasons.

With inspect to (50% nitrobein and 50% biogas) produced the maximum number of leaves per plant followed by using (50% ammonium nitrate and 50% biogas) treatment in the two cuts during two experimental seasons. The control treatments gave the least number of leaves in both cuts and in the two seasons. The beneficial effect of treatments the growing media with different Organic and biofertilizer on the obtain number of leaves per plant could be explained on the basis of the role of these fertilizers in providing the plants with their N-requirements and increasing the availability of other needed nutrient elements in the growing media, which was reflected in growth promotion and consequently producing more branches / plant. fig (5 & 6) bearing more leaves Tables (7 & 8).

These results are in harming with those obtained by **Kandeel *et al.*, (2002)** on *Ocimum basilicum*, L. **Mahfouz (2003)** on *Majorara hortensis*, L. and **Sakr (2005)** on senna plants.

Table (7): Effect of mineral, organic and biofertilization on number of leaves of *Mentha pipperita,L.* in the first season during (2006 / 2007).

Treatments	First season	
	First cut	Second cut
Nitrobein	1033.0	1133.0
Phosphatein	900.0	1100.0
Potaassiumag	966.0	1106.0
Ammonium nitrate	1706.0	2900.0
Calcium super phosphate	1500.0	1996.0
Potassium sulphate	1133.0	2166.0
100% Bioas	1798.0	2399.0
50% Nitr. + 50% N	2800.0	3800.0
50% Phos. + 50% P	1466.0	2166.0
50% Pota. + 50% K	1533.0	2500.0
50% Nitr. + 50% Bio.	3533.0	4500.0
50% Phos. + 50% Bio.	1833.0	2566.0
50% Pota. + 50% Bio.	3100.0	3933.0
50% N + 50% Bio.	3300.0	4033.0
50% P+ 50% Bio.	3000.0	3666.0
50% K+50% Bio.	2500.0	3333.0
75% Bio + 25% N	2000.0	3133.0
75% Bio + 25% P	1533.0	1566.0
75% Bio + 25% K	1833.0	2033.0
100% (N + P + K)	1999.0	3000.0
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	2100.0	3500.0
Control	513.0	900.0
L .S.D 5%	183	264.0

Table (8): Effect of mineral, organic and biofertilization on number of leaves of *Mentha pipperita, L.* in the second season during (2007 / 2008).

Treatments	Second season	
	First cut	Second cut
Nitrobein	1140.0	1341.3
Phosphatein	1000.0	1126.0
Potaassiumag	1066.0	1208.0
Ammonium nitrate	1813.0	2209.6
Calcium super phosphate	1600.0	2558.0
Potassium sulphate	1533.0	2532.0
100% Bioas	1889.0	2890.0
50% Nitr. + 50% N	2880.0	4013.0
50% Phos. + 50% P	1653.0	2637.0
50% Pota. + 50% K	1733.0	2650.0
50% Nitr. + 50% Bio.	3953.0	4875.0
50% Phos. + 50% Bio.	2346.0	3263.0
50% Pota. + 50% Bio.	3860.0	4073.0
50% N + 50% Bio.	3442.0	4300.0
50% P+ 50% Bio.	3180.0	3813.0
50% K+50% Bio.	2060.0	3423.0
75% Bio + 25% N	2400.0	3400.0
75% Bio + 25% P	1666.0	1810.0
75% Bio + 25% K	1973.0	2133.0
100% (N + P + K)	2000.0	3080.0
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	2400.0	3600.0
Control	550.0	853.0
L .S .D 5%	136.0	256.0

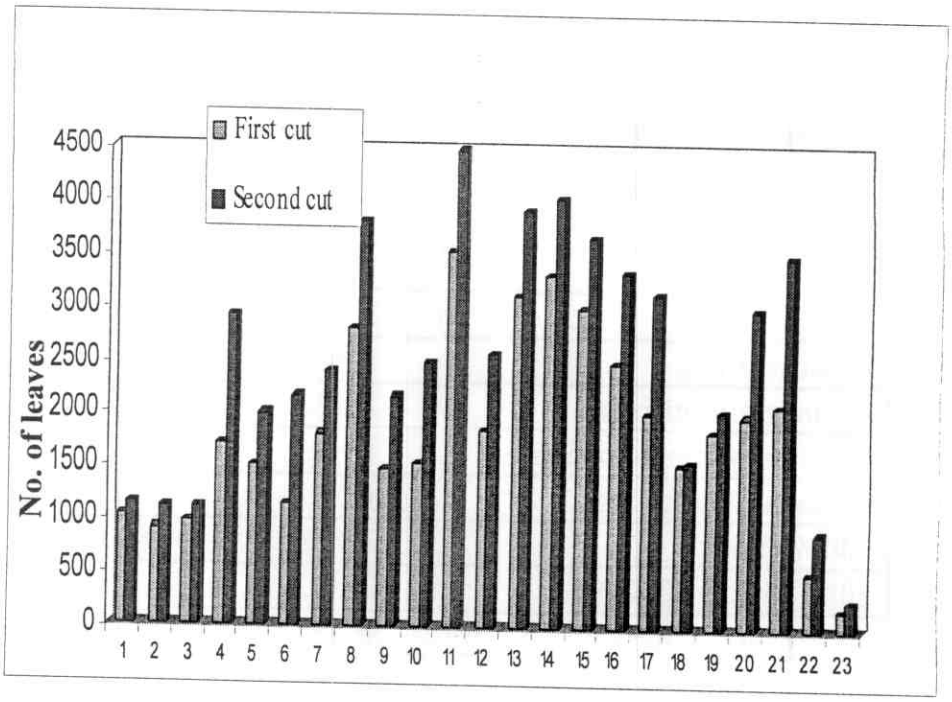
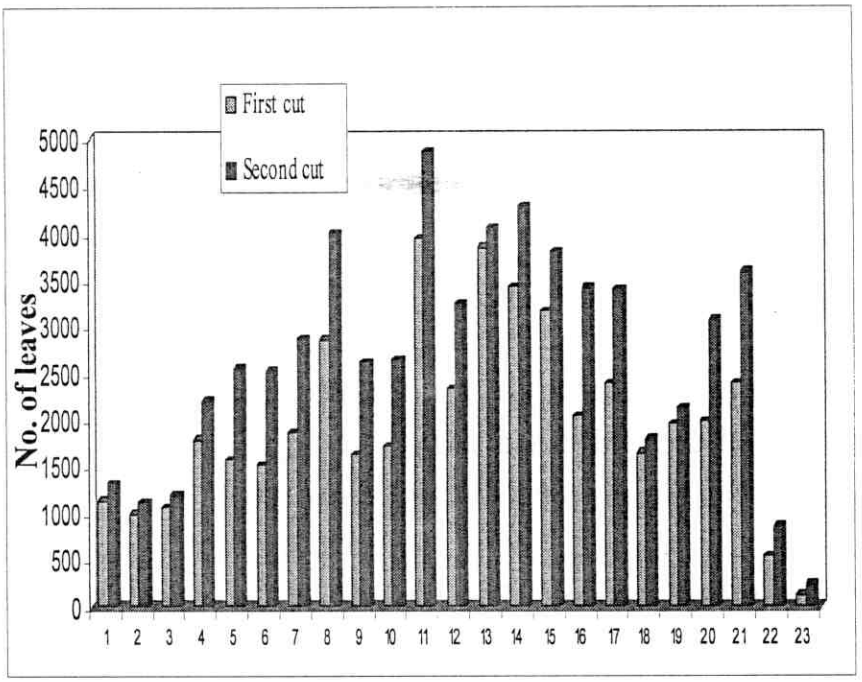


Fig. (5): Effect of mineral, organic and biofertilization on number of leaves of *Mentha pipperita,L.* in the first season during (2006 / 2007).

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)
23. L.S.D. 5%



Treatments

Fig. (6): Effect of mineral, organic and biofertilization on number of leaves of *Mentha pipperita, L.* in the second season during (2007 / 2008).

1. Nitr. 2. Phos. 3. Pota.

4. N 5. P 6. K

7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P

10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.

12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.

14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.

16. 50% K+50% Bio. 17. 75% Bio + 25% N

18. 75% Bio + 25% P 19. 75% Bio + 25% K

20. 100% (N + P + K)

21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)

22. Control (without any fertilizers)

23. L.S.D. 5%

4. 1. 4. Fresh weight of leaves per plant

The reported data in Tables (9 & 10) and Fig (7 & 8) clearly indicate that, the mean fresh weight of leaves per plant was significantly increased as a result of inoculating the growing media of *Mentha piperita*, L plant with 50% of nitrobein, phosphatein, potassiumag and 50% (ammonium nitrate, calcium super phosphate, potassium sulphate). This application gave mostly the heaviest fresh weight of leaves / plant fallowed by the treatment of 50% nitrobein and 50% biogas) in the two cuts during the both growing seasons. The application of 50% ammonium nitrate and 50% biogas gave the third value in this concern in both seasons. The increase in the fresh weight of leaves / plant as a result of the synergistic effect of inoculation with different bacteual strain application of suitable mineral fertilization dose could be attributed to the presence of required nitrogen, phophorus and potassium from biological or chemical sources for maximizing the leaves production. These results are in accordance with those obtained by **Afify (2002)** on fennel plants and **Dewidar (2007)** on *Rosmarinus officinalis*, *Organum majorana* and *Mentha virids*. Generally, the heaviest leaves fresh weight per plant for all treatments was obtained in the second cut in the two growing seasons Tables (9 &10) and Fig (7 & 8).

4. 1. 5. Dry weight of leaves per plant:

It is evident from the data in Tables (11& 12) and Fig (9 & 10) that, the mean dry weight of leaves per plant/followed as well as total fresh herb yields per/fed/seasons the previously stated trend of fresh weight of leaves during the two experimental seasons. The treatment of *Mentha piperita*, L,

Table (9): Effect of mineral, organic and biofertilization on the fresh weight of *Mentha pipperita, L.* in the first season during (2006 / 2007).

Treatments	First season	
	First cut	Second cut
Nitrobein	49.1	47.1
Phosphatein	41.3	59.3
Potaassiumag	34.5	25.06
Ammonium nitrate	94.9	141.1
Calcium super phosphate	65.7	103.7
Potassium sulphate	63.7	100.3
100% Bioas	79.6	121.7
50% Nitr. + 50% N	106.3	138.6
50% Phos. + 50% P	84.4	129.06
50% Pota. + 50% K	101.1	120.8
50% Nitr. + 50% Bio.	126.8	193.3
50% Phos. + 50% Bio.	93.3	128.3
50% Pota. + 50% Bio.	97.0	151.6
50% N + 50% Bio.	113.3	165.0
50% P+ 50% Bio.	89.5	150.0
50% K+50% Bio.	83.3	143.5
75% Bio + 25% N	87.3	114.2
75% Bio + 25% P	55.2	53.3
75% Bio + 25% K	57.6	63.0
100% (N + P + K)	155.0	150.0
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	160.0	255.0
Control	45.7	85
L .S .D 5%	12.3	15.39

Table (10): Effect of mineral, organic and biofertilization on the fresh weight of Mentha pipperita, L. in the second season during (2007 / 2008).

Treatments	Second season	
	First cut	Second cut
Nitrobein	54.72	62.00
Phosphatein	46.60	29.00
Potaassiumag	53.50	51.40
Ammonium nitrate	98.30	141.80
Calcium super phosphate	69.60	125.60
Potassium sulphate	68.60	106.81
100% Bioas	81.70	130.90
50% Nitr. + 50% N	115.10	157.60
50% Phos. + 50% P	86.06	142.40
50% Pota. + 50% K	107.70	130.00
50% Nitr. + 50% Bio.	115.00	198.30
50% Phos. + 50% Bio.	98.06	149.30
50% Pota. + 50% Bio.	106.70	160.60
50% N + 50% Bio.	106.90	171.00
50% P+ 50% Bio.	93.60	165.00
50% K+50% Bio.	85.80	145.60
75% Bio + 25% N	92.30	123.80
75% Bio + 25% P	60.20	58.90
75% Bio + 25% K	62.30	72.06
100% (N + P + K)	165.00	140.00
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	171.00	229.10
Control	47.10	99.00
L .S .D 5%	13.90	16.21

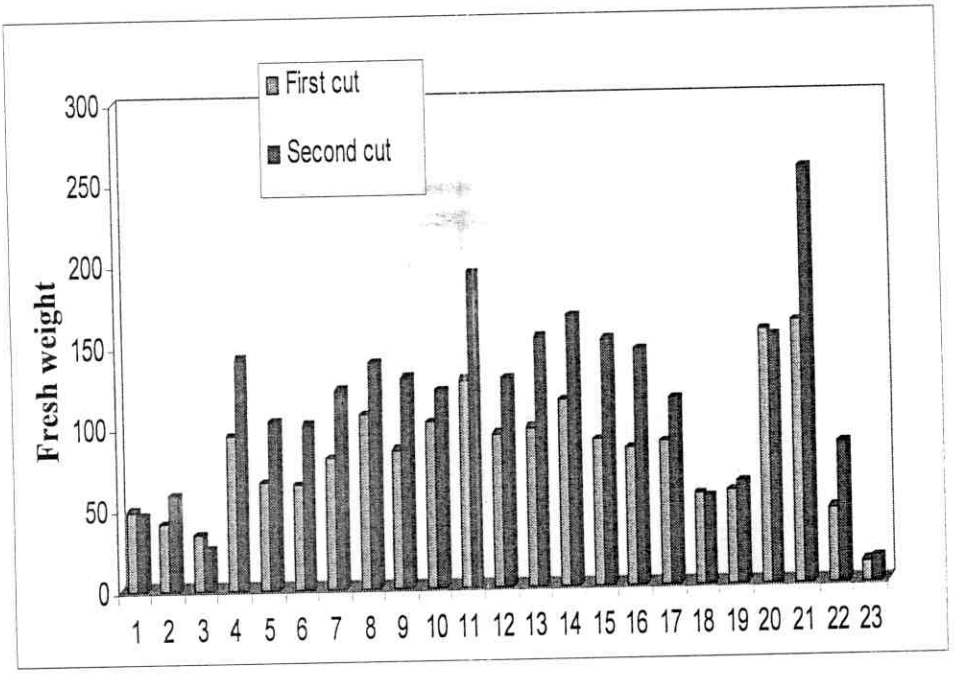


Fig. (7): Effect of mineral, organic and biofertilization on the fresh weight of *Mentha pipperita, L.* in the first season during (2006 / 2007).

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)
23. L.S.D. 5%

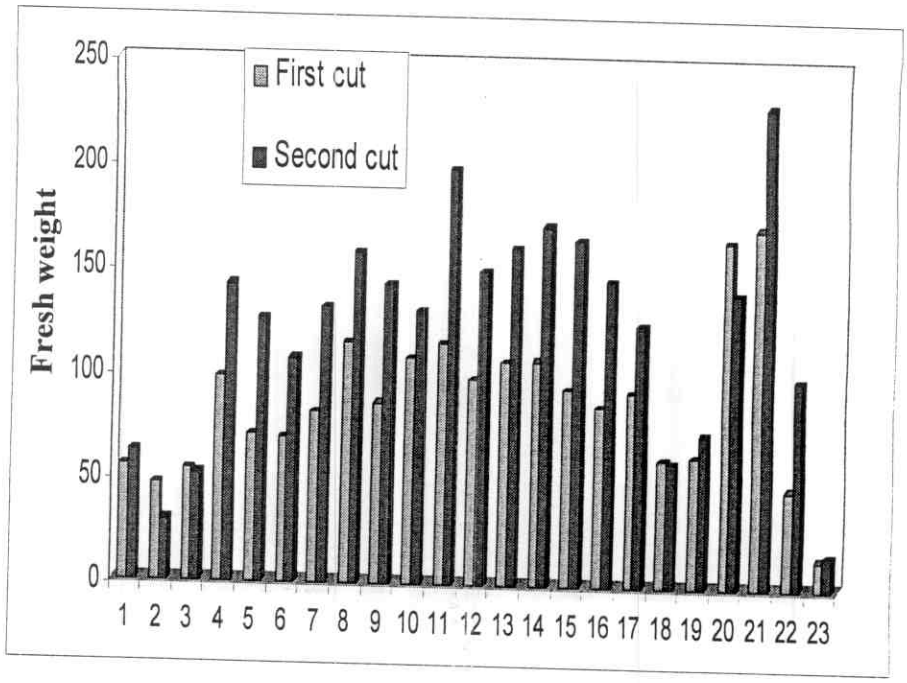


Fig. (8): Effect of mineral, organic and biofertilization on the fresh weight of Mentha pipperita, L. in the second season during (2007 / 2008).

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)
23. L.S.D. 5%

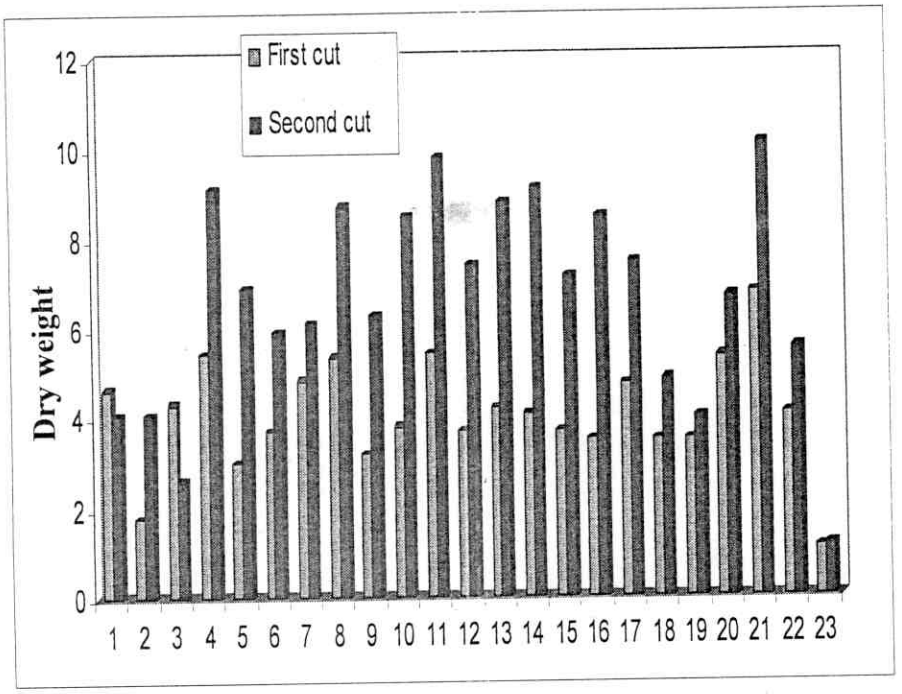


Fig. (9): Effect of mineral, organic and biofertilization on dry weight of *Mentha pipperita, L.* in the first season during (2006 / 2007).

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)
23. L.S.D. 5%

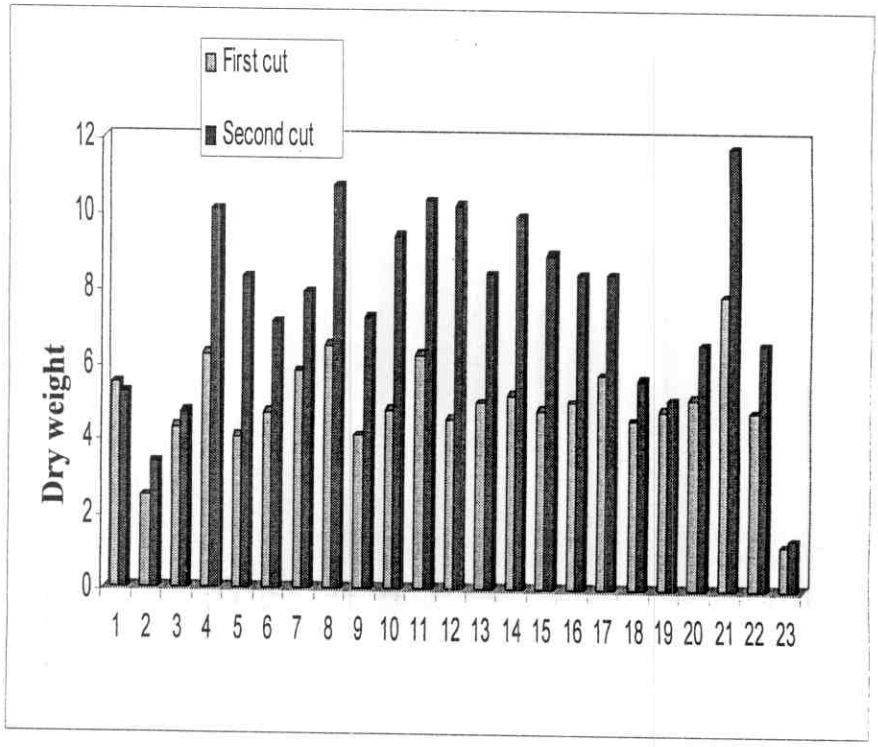


Fig. (10): Effect of mineral, organic and biofertilization on dry weight of leaves per plant of *Mentha pipperita, L.* in the second season during (2007 / 2008).

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)
23. L.S.D. 5%

plants with 50% of (Nitrobein + phosphatein + potassiumage) + 50% of (ammonium nitrate + super calcium phosphate + potassium sulphate) resulted in significantly heavier dry weight of leaves per plant and consequently per feddan/seasons in comparison with the control (without any fertilizers) in the two experimental seasons. While using 50% nitrobein + 50% biogas gave the next value in this concern. The previously mentioned results could be also supported by the finding of **Mahfouz (2003)** on *Majorana hortensis* **Sakr (2005)** on senna plants and **Mazrou (2008)** on Mentha plants.

4. 2. The chemical constituents of the plants

4. 2. 1. Essential oil content

The data in Table (13 &14) and Fig. (11 & 12) indicate that, essential oil percentage in the fresh herb of *Mentha piperita*, L plants was improved as a result of inoculating the growing media with 50% (nitrobein + phosphatein + potassiumag) + 50% (ammonium nitrate + calcium super phosphate + potassium sulphate) in comparison with control treatment (without any addition) in the different cuts during the two growing seasons.

Otherwise the next improved in this respect could be observed with the treatment of 50% nitrobein + 5% biogas. On the other hand the lowest essential oil percentage was obtained by the control treatment in the two cuts in both growing seasons.

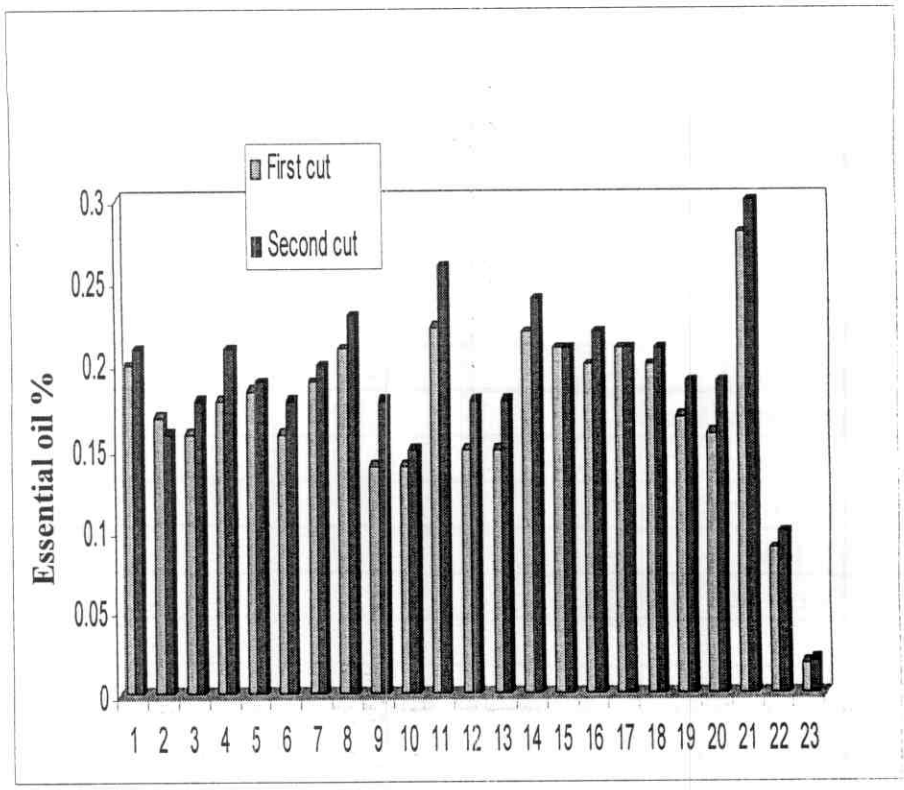
The improvement in the essential oil percentage in the fresh herb as a result of application the bio-fertilization with mineral elements or bio-fertilization with biogas in comparison with control or using mineral elements without inoculation could be explained through the interpretations of **Youssef *et al.*, (2004)**

Table (13): Effect of mineral, organic and biofertilization on the essential oil percentage of *Mentha pipperita, L.* in the first season during (2006 / 2007).

Treatments	First season	
	First cut	Second cut
Nitrobein	0.200	0.210
Phosphatein	0.170	0.160
Potaassiumag	0.160	0.180
Ammonium nitrate	0.180	0.210
Calcium super phosphate	0.186	0.190
Potassium sulphate	0.160	0.180
100% Bioas	0.190	0.200
50% Nitr. + 50% N	0.210	0.230
50% Phos. + 50% P	0.140	0.180
50% Pota. + 50% K	0.140	0.150
50% Nitr. + 50% Bio.	0.223	0.260
50% Phos. + 50% Bio.	0.150	0.180
50% Pota. + 50% Bio.	0.150	0.180
50% N + 50% Bio.	0.220	0.240
50% P+ 50% Bio.	0.210	0.210
50% K+50% Bio.	0.200	0.220
75% Bio + 25% N	0.210	0.210
75% Bio + 25% P	0.200	0.210
75% Bio + 25% K	0.170	0.190
100% (N + P + K)	0.160	0.190
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	0.280	0.300
Control	0.090	0.100
L . S .D 5%	0.019	0.021

Table (14): Effect of mineral, organic and biofertilization on the essential oil percentage in the second season during (2007 / 2008).

Treatments	Second season	
	First cut	Second cut
Nitrobein	0.22	0.23
Phosphatein	0.19	0.20
Potaassiumag	0.19	0.20
Ammonium nitrate	0.20	0.23
Calcium super phosphate	0.20	0.21
Potassium sulphate	0.19	0.20
100% Bioas	0.19	0.21
50% Nitr. + 50% N	0.24	0.25
50% Phos. + 50% P	0.15	0.20
50% Pota. + 50% K	0.16	0.17
50% Nitr. + 50% Bio.	0.25	0.26
50% Phos. + 50% Bio.	0.18	0.20
50% Pota. + 50% Bio.	0.19	0.20
50% N + 50% Bio.	0.23	0.25
50% P+ 50% Bio.	0.22	0.23
50% K+50% Bio.	0.22	0.23
75% Bio + 25% N	0.21	0.22
75% Bio + 25% P	0.21	0.22
75% Bio + 25% K	0.19	0.21
100% (N + P + K)	0.17	0.19
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	0.29	0.30
Control	0.10	0.12
LSD 5%	0.09	0.09



Treatment

Fig. (11): Effect of mineral, organic and biofertilization on the essential oil percentage of *Mentha pipperita, L.* in the first season during (2006 / 2007).

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)
23. L.S.D. 5%

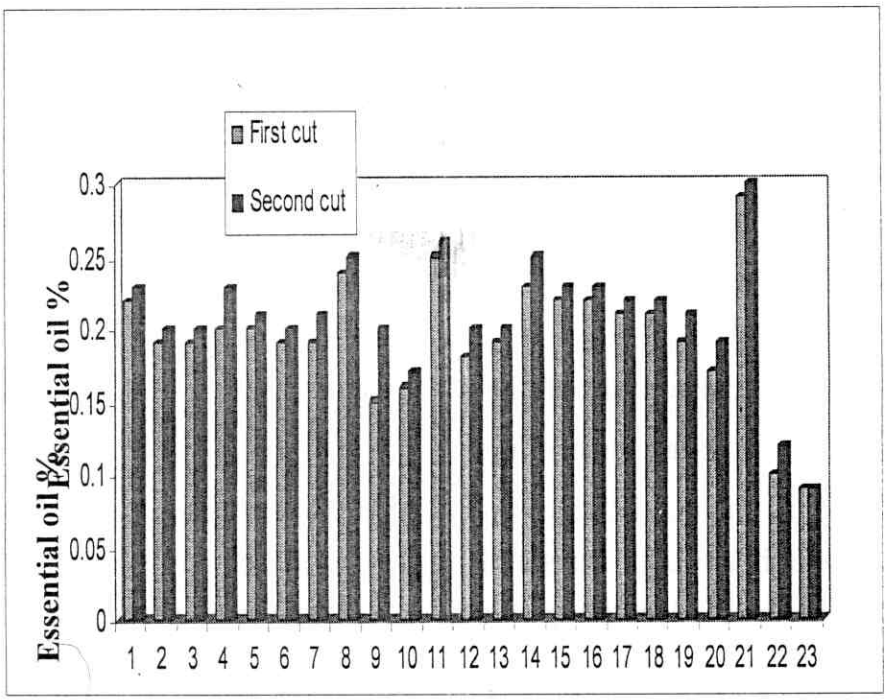


Fig. (12): Effect of mineral, organic and biofertilization on the essential oil percentage in the second season during (2007 / 2008).

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)
23. L.S.D. 5%

on *Salvia officinalis*. L plants, who demonstrated that the growth hormones producing by microorganisms improved essential oil content and yield when compared with the untreated plant. These results are in accordance with those obtained by **Mahfouz (2003)** on *Majorana hortensis*, **Dewidar (2007)** on *Rosmrinus officinalis*, L and *Mentha virids*, L and **Mazrou (2008)** on *Cymbopogon citrates*.

4. 2. 2 Mineral content of herb:

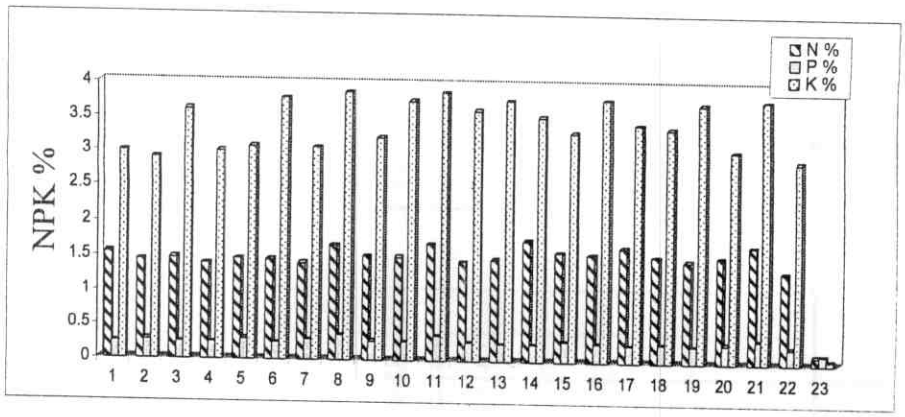
4. 2. 2. 1. Nitrogen percentage:

The recorded data in Table (15 & 16) and Figs. (13 & 14) clearly indicate that measured total nitrogen percentage in the dried herb of *Mentha piperita*, L. plants was considerably improved as a result of fertilizing the growing media. The different micro organisms, which play an important role in the process of fixing at mospheric nitrogen and its conversion to a useful from for utilization by the plant. The obtained results revealed that, the application of the different fertilizers caused an increase in the total nitrogen percentage of the produced herb of peppermint plants in comparison with control plants without any fertilizers in the two cuts during both experimental seasons.

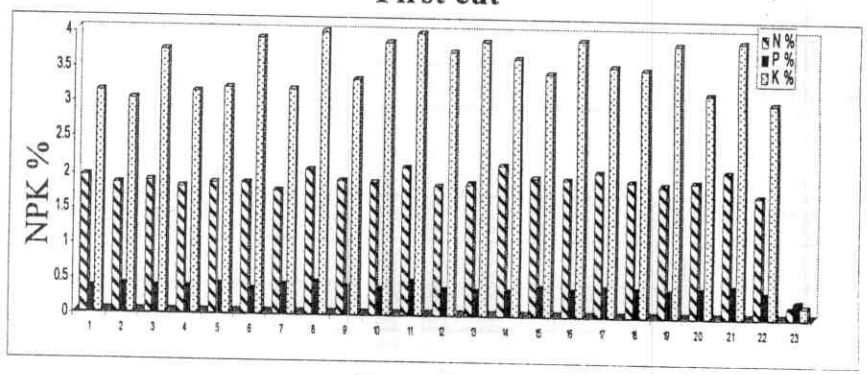
A variation in this respect between the different investigated fertilizer types could be observed the treatments of (50% nitrobein + 50% ammonium sulphate), (50% nitrobein + 50% biogas) and 50% of (nitrobein + phosphatein + potassiumage) + 50% of (ammonium nitrate + calcium super phosphate + potassium sulphate) gave relatively the highest nitrogen percentage in both cuts during the first and second seasons.

Table (15): Effect of mineral, organic and biofertilization on N, P and K percentage in the dried herb of *Mentha pipperita*, L. plants during (2006 / 2007):

Treatments	First cut			Second cut		
	N %	P %	K %	N %	P %	K %
Nitrobein	1.53	0.23	2.98	1.93	0.35	3.11
Phosphatein	1.42	0.27	2.89	1.82	0.39	3.02
Potaassiumag	1.46	0.24	3.60	1.88	0.36	3.73
Ammonium nitrate	1.38	0.24	2.99	1.78	0.36	3.12
Calcium super phosphate	1.45	0.29	3.06	1.85	0.41	3.19
Potassium sulphate	1.44	0.23	3.77	1.84	0.35	3.90
100% Bioas	1.39	0.28	3.04	1.74	0.40	3.17
50% Nitr. + 50% N	1.65	0.34	3.86	2.05	0.46	3.99
50% Phos. + 50% P	1.49	0.27	3.19	1.89	0.39	3.32
50% Pota. + 50% K	1.48	0.25	3.73	1.88	0.37	3.86
50% Nitr. + 50% Bio.	1.68	0.34	3.85	2.08	0.47	3.98
50% Phos. + 50% Bio.	1.42	0.25	3.60	1.82	0.37	3.73
50% Pota. + 50% Bio.	1.46	0.23	3.74	1.86	0.35	3.87
50% N + 50% Bio.	1.73	0.23	3.51	2.13	0.35	3.64
50% P+ 50% Bio.	1.56	0.28	3.28	1.96	0.40	3.41
50% K+50% Bio.	1.54	0.25	3.77	1.94	0.37	3.90
75% Bio + 25% N	1.64	0.24	3.40	2.04	0.40	3.53
75% Bio + 25% P	1.52	0.26	3.35	1.92	0.38	3.48
75% Bio + 25% K	1.46	0.24	3.71	1.86	0.36	3.84
100% (N + P + K)	1.51	0.27	3.03	1.91	0.39	3.15
50% (Nitr.+Phos. +Pota.) +50% (N+P+K)	1.67	0.32	3.76	2.07	0.44	3.89
Control	1.32	0.22	2.88	1.72	0.34	3.01
LSD 5%	0.11	0.12	0.05	0.15	0.24	0.18



Treatment
First cut



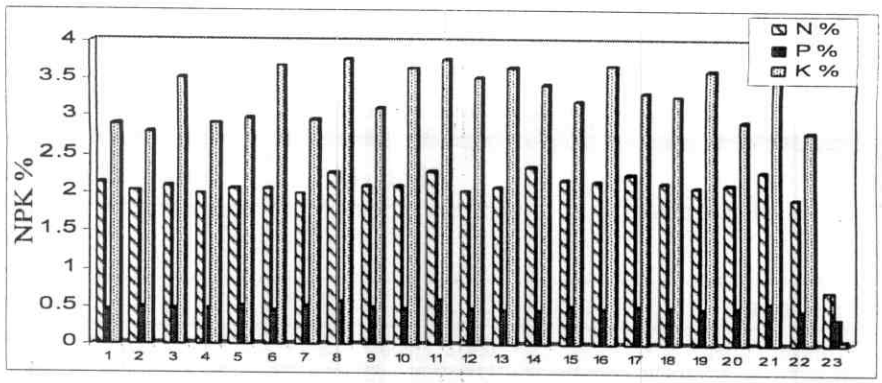
Treatment
Second Cut

Fig. (13): Effect of mineral, organic and biofertilization on N, P and K percentage in the dried herb of *Mentha pipperita*, L. plants during (2006 / 2007)

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)
23. L.S.D. 5%

Table (16): Effect of mineral, organic and biofertilization on N, P and K percentage in the dried herb of *Mentha pipperita*, L. plants during (2007/2008):

Treatments	First cut			Second cut		
	N %	P %	K %	N %	P %	K %
Nitrobein	2.13	0.46	2.88	2.43	0.58	3.28
Phosphatein	2.02	0.50	2.79	2.32	0.62	3.19
Potaassiumag	2.08	0.47	3.50	2.38	0.59	3.90
Ammonium nitrate	1.98	0.47	2.89	2.28	0.59	3.29
Calcium super phosphate	2.05	0.52	2.96	2.35	0.64	3.36
Potassium sulphate	2.04	0.46	3.67	2.34	0.58	4.07
100% Bioas	1.98	0.51	2.94	2.28	0.63	3.34
50% Nitr. + 50% N	2.25	0.57	3.76	2.55	0.69	4.16
50% Phos. + 50% P	2.09	0.50	3.09	2.39	0.62	3.49
50% Pota. + 50% K	2.08	0.48	3.63	2.38	0.60	4.03
50% Nitr. + 50% Bio.	2.28	0.58	3.75	2.58	0.70	4.15
50% Phos. + 50% Bio.	2.02	0.48	3.50	2.32	0.60	3.90
50% Pota. + 50% Bio.	2.06	0.46	3.64	2.36	0.58	4.04
50% N + 50% Bio.	2.33	0.46	3.41	2.63	0.58	3.81
50% P+ 50% Bio.	2.16	0.51	3.18	2.46	0.63	3.58
50% K+50% Bio.	2.14	0.48	3.67	2.44	0.60	4.07
75% Bio + 25% N	2.24	0.51	3.30	2.54	0.63	3.70
75% Bio + 25% P	2.12	0.49	3.25	2.42	0.61	3.65
75% Bio + 25% K	2.06	0.47	3.61	2.36	0.59	4.01
100% (N + P + K)	2.11	0.50	2.92	2.41	0.62	3.32
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	2.27	0.55	3.66	2.57	0.67	4.06
Control	1.92	0.45	2.78	2.22	0.57	3.18
LSD 5%	0.71	0.35	0.05	1.01	0.47	0.45



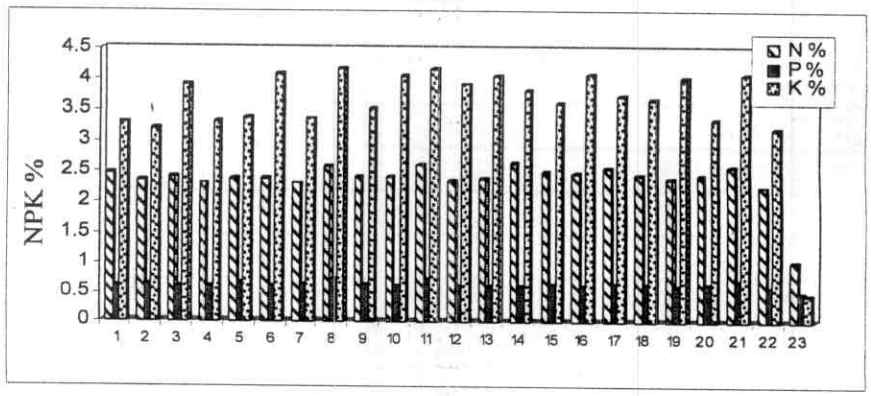


Fig. (14): Effect of mineral, organic and biofertilization on N, P and K percentage in the dried herb of *Mentha pipperita*, L. plants in the second cut during (2007/2008)

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)
23. L.S.D. 5%

Similar findings were observed before by some investigators like **Attia and Saad (2001)** on *Catharanthus roses*, **Luo *et al.*, (2003)** on *Cassia nictitans* and **Mazrou (2008)** on *Mentha piperita*, L.

4. 2. 2. 2. Phosphorus percentage

Regarding, the effect of using different kind of fertilizers (mineral, organic and bio-fertilization) on phosphorus content in the dried herb of *Mentha piperita*, L. plants, it could noticed that, fertilizing 50% of (nitrobein + ammonium nitrate) and 50% of (nitrobein + Biogas) gave the maximum phosphorus percentage in both seasons and two cuts.

While using 50% of (nitrobein + phosphatein + potassiumage) + 50% of ammonium nitrate + calcium super phosphate + potassium sulphate) gave the next value in this concern. On the other hand control (without any fertilizer) gave the least value in this respect Table (15 & 16).

The beneficial effect of inoculating the growing media with the different bacteria could be explained through the finding of **Tagnow *et al.*, (1991),** who stated that the inoculating the growing media of beans with Azotobacter and Azopirillum strains produced adequate amounts of IAA and cytokines which increased the surface area per unit root length and root hair branching with eventual increase in nutrients uptake from the soil. In addition, the previously obtained results could be also assured by the finding of **Mahfouz (2003)** on *Majorana hortensis* **Sakr (2005)** on senna plants and **Mazrou (2008)** on *Cymbopogon citrates*.

4. 2. 2. 3. Potassium percentage

The data in Table (15 & 16) show that the application of the different fertilization (mineral, organic, bio) on *Mentha piperita*, L plants caused a marked increase in K percentage in the dried herb in comparison with control (without fertilizers) during the two cuts of both seasons. The best results in this respect were obtained by using the (50% nitrobein + 50% ammonium nitrate) or 50% nitrobein 50% biogas). The oformentioned trend was assured by the findings of **Kandeel *et al.*, (2001)** and **Afify (2002)** on *foeniculum vulgare.*

4. 2. 3. Photosynthetic pigments

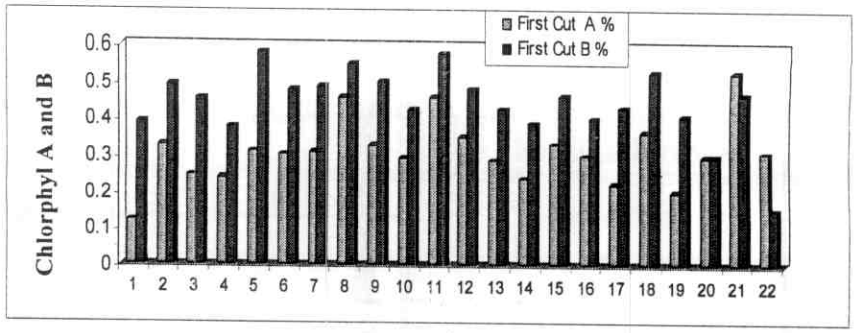
4. 2. 3. 1. Chlorophyll A and B contents

The recorded data in Table (17) and Fig. (15) indicate that, the concentration of chlorophyll (a) in the fresh leaves of *Mentha piperita*, L. plants was considerably improved as a result of fertilization with the different organic and bio-fertilization when compared with control (without fertilizers) or with each minerals fertilizer alone.

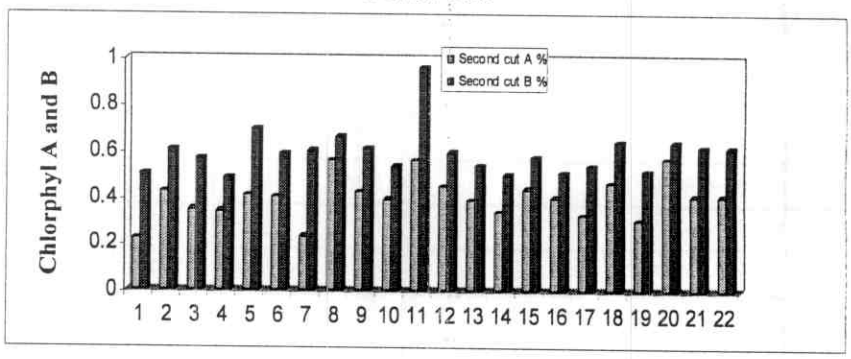
The treatments of (50% nitrobein + 50% ammonium nitrate), (50% nitrobein + 50% biogas) and [50% of (nitrobein + phosphatein + potassiumag) + 50% of (N + P + K)] resulted the highest Chlorophyll (a and b) in the leaves of peppermint plants in comparison with those found in the leaves of the plants treated with another fertilizers and control. On the other hand, the lowest value in this respect were found in the leaves of control plant grown without bacteual inoculation or mineral fertilizers in the two cuts of both growing seasons.

Table (17): Effect of mineral, organic and biofertilization on chlorophyll A and B content in the fresh leaves of *Mentha pipperita, L.* plant mg/g in the first and second seasons.

Treatments	First cut		Second cut	
	A	B	A	B
Nitrobein	0.123	0.393	0.224	0.503
Phosphatein	0.330	0.496	0.431	0.606
Potaassiumag	0.250	0.460	0.351	0.570
Ammonium nitrate	0.243	0.380	0.344	0.490
Calcium super phosphate	0.316	0.586	0.417	0.696
Potassium sulphate	0.306	0.483	0.407	0.593
100% Bioas	0.312	0.493	0.233	0.603
50% Nitr. + 50% N	0.463	0.553	0.564	0.663
50% Phos. + 50% P	0.330	0.506	0.431	0.616
50% Pota. + 50% K	0.296	0.426	0.397	0.536
50% Nitr. + 50% Bio.	0.463	0.583	0.564	0.963
50% Phos. + 50% Bio.	0.353	0.486	0.454	0.596
50% Pota. + 50% Bio.	0.290	0.430	0.391	0.543
50% N + 50% Bio.	0.240	0.390	0.341	0.500
50% P+ 50% Bio.	0.333	0.466	0.44	0.576
50% K+50% Bio.	0.303	0.403	0.404	0.513
75% Bio + 25% N	0.226	0.433	0.327	0.543
75% Bio + 25% P	0.366	0.533	0.467	0.643
75% Bio + 25% K	0.203	0.410	0.304	0.520
100% (N + P + K)	0.300	0.30	0.571	0.641
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	0.531	0.470	0.411	0.623
Control (with out any fertilizers)	0.310	0.153	0.411	0.620



Treatment
First cut



Treatment
Second cut

Fig. (15): Effect of mineral, organic and biofertilization on chlorophyll A and B content in the fresh leaves of *Mentha pipperita, L.* plant mg/g in the first and second seasons.

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)

The increase in Chlorophyll a and b content the fresh leaves as a result of inoculation with different strains of bacteria could be explained through the interpretations of **Dewidar (2007)** who stated that the increase in Chlorophyll (a, b) content might be not only due to the increment in nitrogen fixation but also to increase in trace elements\ availability in the growing media which caused by the organic acids produced by microbial strains leading to decrease in the ph of the soil. These results are similar to those obtained by **Afify (2002)** on *Majorana hortensis* and **Mazrou (2008)** on *Mentha piperita*, L. assured the previously mentioned trend.

4.2.4. Oil components by GLC:

Table (18) and Figures (16 a & b) showed the different components separated and identified from Mentha oil leaves samples produced from the plants additions of biofertilizers, organic and minerals. The obtained of chromatogram analysis revealed the presence of 11 components. The identified components in Mentha oil leaves are 1.8 cineole, pulegone, limonene, menthon, isomenthone, isomenthol, methylacetate, menthofurance, menthol, bisabelone and piperitone .

The relative percentage areas indicating that the effect of the different bio, organic and mineral fertilizers on the composition of the oil samples

It was obvious that 1.8 cineole, pulegone, limonene and isomenthol were found to increase in response to 50% (nitrobein + phosphotein + potassiumage) + 50% (ammonium nitrate + calcium superphosphate + potassium sulphate) in comparison to other treatments or control plants.

Table (18): Effect of mineral, organic and biofertilization on the components of oil of *Mentha piperita* in the second season.

Component Treatment	1.8 Cineole	Puleogne	Limonene	Menthon	Iso-menthone	ISo-menthol	Methyl-acetate	Mentho-furance	Menthol	Bisabel-one	piperitone	Unidentified
50% (Nitr.+ Phos.+Pota.) +50% (N+P+K)	9.876	5.257	6.115	11.377	3.698	5.524	5.529	3.744	23.954	0.321	1.687	22.918
50% Nitr. + 50% N	7.982	4.254	2.389	8.668	1.121	1.641	4.622	3.125	43.020	2.276	2.083	18.918
50% Nitr. + 50% Bio.	7.487	3.505	5.595	4.681	10.941	0.790	3.507	2.525	38.719	4.925	1.161	16.164
50% N. + 50% Bio.	7.459	3.933	3.518	12.014	2.992	3.460	5.993	1.817	43.628	2.451	1.328	11.407
50% P. + 50% Bio.	8.841	4.732	4.526	12.347	3.628	4.191	6.718	1.983	30.826	2.581	1.308	18.319
Control (without any fertilizers)	7.359	5.189	3.436	14.697	2.795	1.327	4.087	2.281	32.895	1.806	1.841	22.287

Nitr. = Nitrobein **Phos.= Phosphatein** **Pota. = Potassiumag**
N = Ammonium nitrate **P = Calcium super phosphate**
K = Potassium sulphate **Bio. = Biogas**

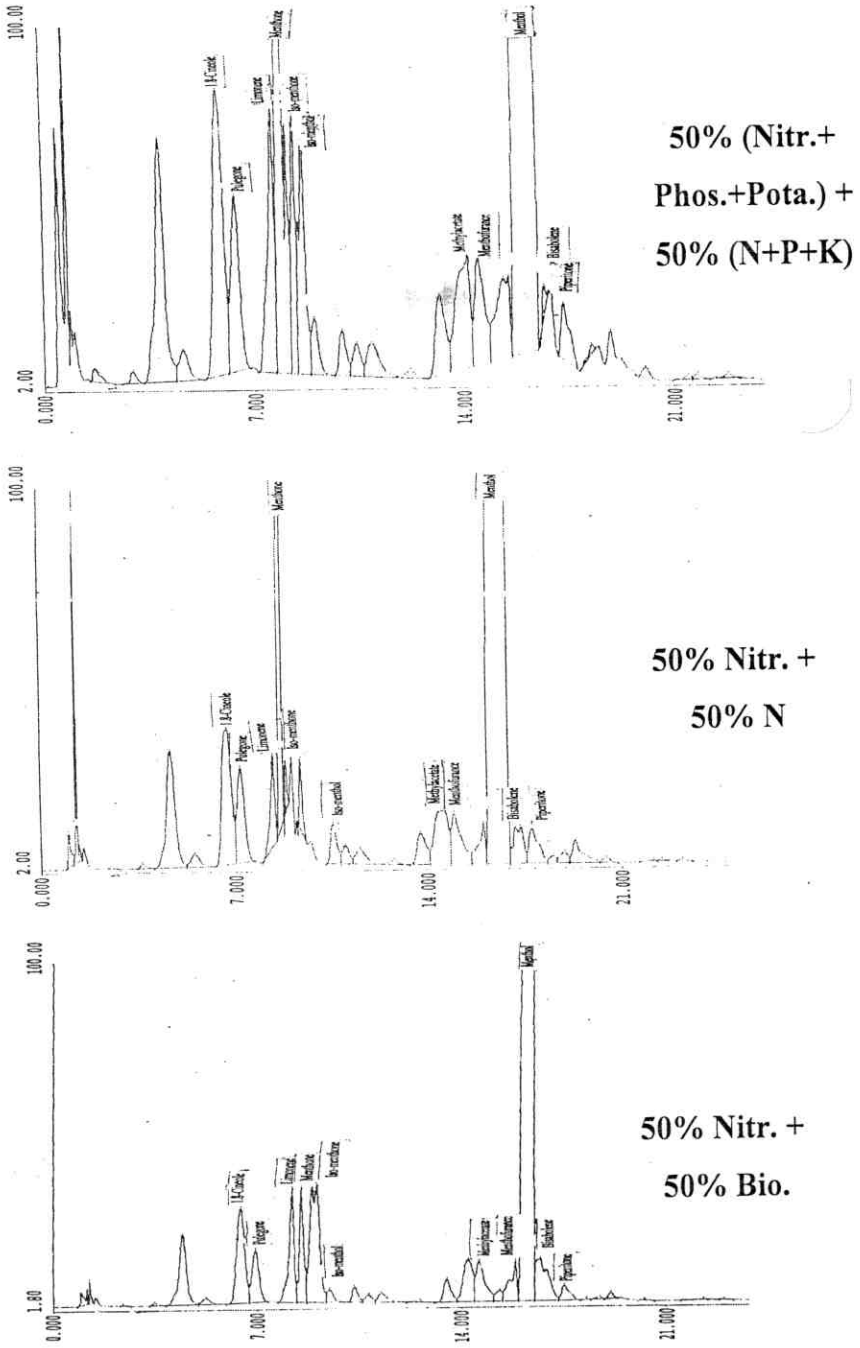


Fig. (16-a): Effect of mineral, organic and biofertilization on the components of oil of *Mentha piperita* in the second season

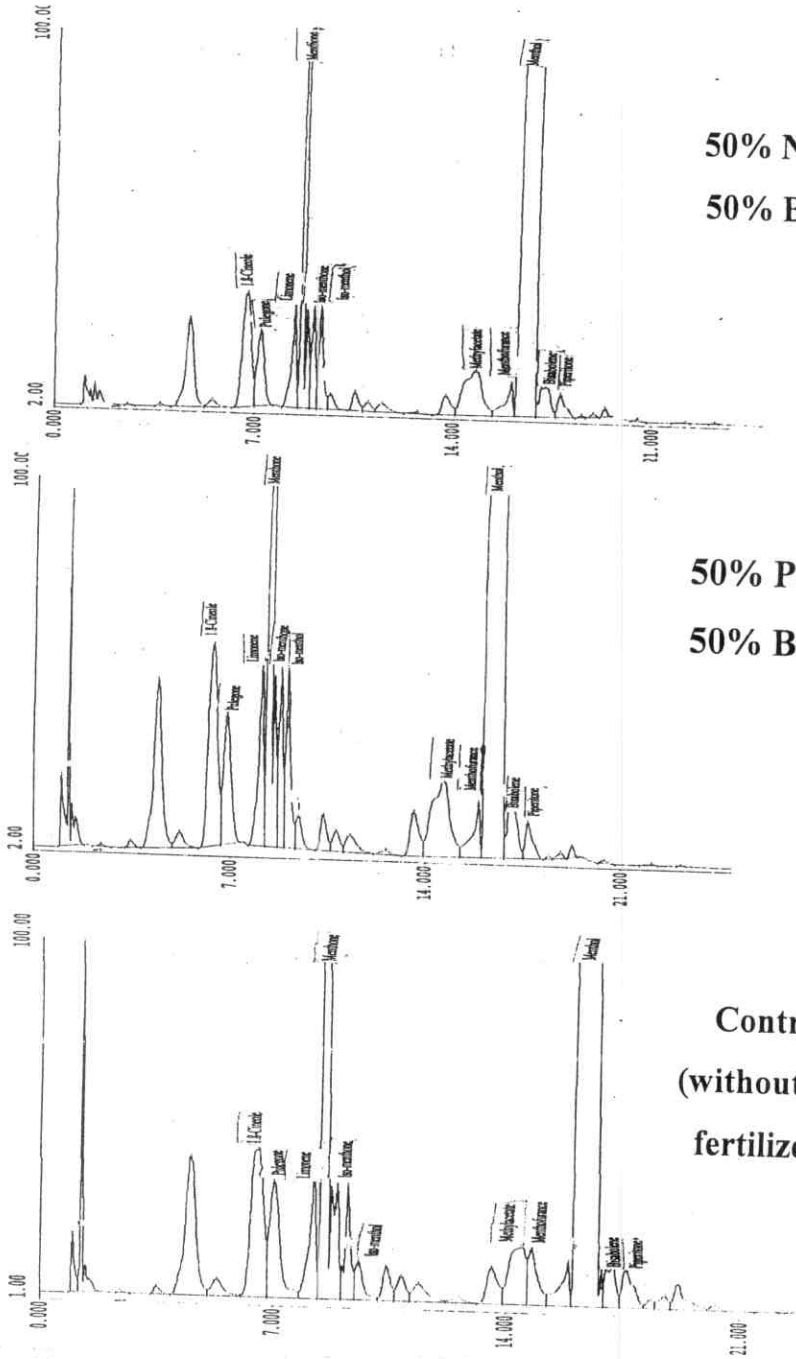


Fig. (16-b): Effect of mineral, organic and biofertilization on the components of oil of *Mentha piperita* in the second season

On the other hand, menthon increase with control plants comparing with other application. While 50% ammonium nitrate + 50% biogase, 50% calcium superphosphate + 50% biogase, gave the height contents, gave the next value of increasing the menthon.

Using (50% nitrobein + 50% biogas) gave the maximum contents of isomenthone and bisabelone.

The applications of (50% nitrobein + 50% ammonium nitrate) and gave the highest content of menthol, Table (18). While bisabelone content increased by using 50% of nitrobein + 50% of biogas.

It was obvious that pipertone content increasing in response to add (50% nitrobein + 50% ammonium nitrate) can be explained the enhancement of vegetative growth and yield of oil due to the increasing total N, organic matter and hums in soil, increasing soil properties and water holding capacity, making most micronutrients more readly available at a wide range of pH and faster release of essential nutrients by microbial decomposition.

Also applications biofertilizers improve the vegetative growth, yield of oil can be discuss that by the fixation of the atmospheric N, which causes an increment of available N and that increase, consequently the formation of many metabolites. Also N-fixing bacteria produced adequate amounts of phytohormones such as indole acetic acid, gibberellins and cytokinins. On the other side, using phosphatein and potassiumage may be increasing the available P and K that

increase the many metabolities may be which increment vegetative growth and yield of oil.

4.3. Effect of mineral, organic and biofertilization on *Mentha peprita* on storage period (days):

Data in Table (19 & 20) and Fig (17 & 18) clearly showed that significant differences were found among treatments in storage period (days) in the two cuts of both growing seasons. The fertilization with 50% [(Nitrobein, Phosphatein and Potassiumag) + 50% (ammonium nitrate, calcium superphosphate and potassium sulphate)] gave the mostly taller storage period in comparison with other treatments of fertilizers and control plants. This treatments gave (20.2, 21.6 days) in the first seasons for both cuts, respectively while the same treatments produced 22.1, 21.8 days for two cuts in the second seasons, respectively. While the minimum storage period (15.4 days) was resulted from the control plants (without any fertilization).

On the other side, the second result in this concern produced from potassiumage at 50% + biogas at 50% treatment in the two cuts during both growing seasons.

These results are similar to these obtained by **Dewidar (2007)** on *Mentha viridis*, linn who found that using compost and biofertilizer under pre cooling increased the storage period.

Table (19): Effect of mineral, organic and biofertilization on storage period (days) of *Mentha piperita*, during first season (2006 / 2007)

Treatments	First season	
	First cut	Second cut
Nitrobein	17.1	16.6
Phosphatein	17.9	17.5
Potaassiumag	16.5	17.0
Ammonium nitrate	16.9	16.2
Calcium super phosphate	17.3	19.0
Potassium sulphate	16.6	17.0
100% Bioas	17.0	18.1
50% Nitr. + 50% N	18.1	19.5
50% Phos. + 50% P	18.6	19.3
50% Pota. + 50% K	18.9	18.0
50% Nitr. + 50% Bio.	17.9	18.3
50% Phos. + 50% Bio.	15.9	16.2
50% Pota. + 50% Bio.	19.1	20.9
50% N + 50% Bio.	16.0	16.4
50% P+ 50% Bio.	17.0	16.8
50% K+50% Bio.	18.6	18.0
75% Bio + 25% N	15.8	16.0
75% Bio + 25% P	16.3	15.7
75% Bio + 25% K	17.4	16.9
100% (N + P + K)	16.0	15.9
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	20.2	21.6
Control (with out any fertilizers)	15.4	16.0
L . S . D at 5%	0.7	0.9

Table (20): Effect of mineral, organic and biofertilization on storage period (days) of *Mentha piperita*, during second season (2007 / 2008)

Treatments	Second season	
	First cut	Second cut
Nitrobein	16.9	17.3
Phosphatein	18.1	17.2
Potaassiumag	17.6	18.0
Ammonium nitrate	16.9	17.0
Calcium super phosphate	18.3	19.1
Potassium sulphate	16.9	17.4
100% Bioas	17.8	19.0
50% Nitr. + 50% N	19.1	19.3
50% Phos. + 50% P	19.9	18.9
50% Pota. + 50% K	18.7	18.5
50% Nitr. + 50% Bio.	18.5	19.0
50% Phos. + 50% Bio.	17.1	16.1
50% Pota. + 50% Bio.	20.7	21.0
50% N + 50% Bio.	16.1	16.3
50% P+ 50% Bio.	16.6	18.0
50% K+50% Bio.	18.2	18.0
75% Bio + 25% N	16.5	16.3
75% Bio + 25% P	16.0	15.9
75% Bio + 25% K	17.2	17.3
100% (N + P + K)	15.0	16.2
50% (Nitr.+Phos.+Pota.) +50% (N+P+K)	22.1	21.8
Control (with out any fertilizers)	15.7	16.9
L . S . D at 5%	0.8	1.0

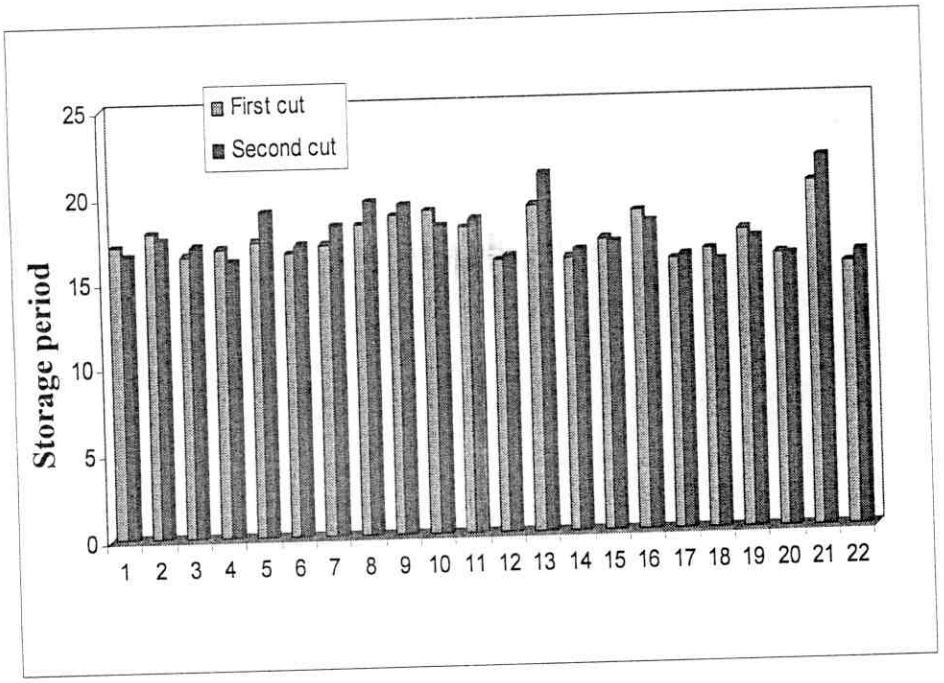


Fig. (17): Effect of mineral, organic and biofertilization on storage period (days) of *Mentha piperita*, during first season (2006 / 2007)

1. Nitr. 2. Phos. 3. Pota.
4. N 5. P 6. K
7. 100% Bio. 8. 50% Nitr. + 50% N 9. 50% Phos. + 50% P
10. 50% Pota. + 50% K 11.50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio. 13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio. 15. 50% P+ 50% Bio.
16. 50% K+50% Bio. 17. 75% Bio + 25% N
18. 75% Bio + 25% P 19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)

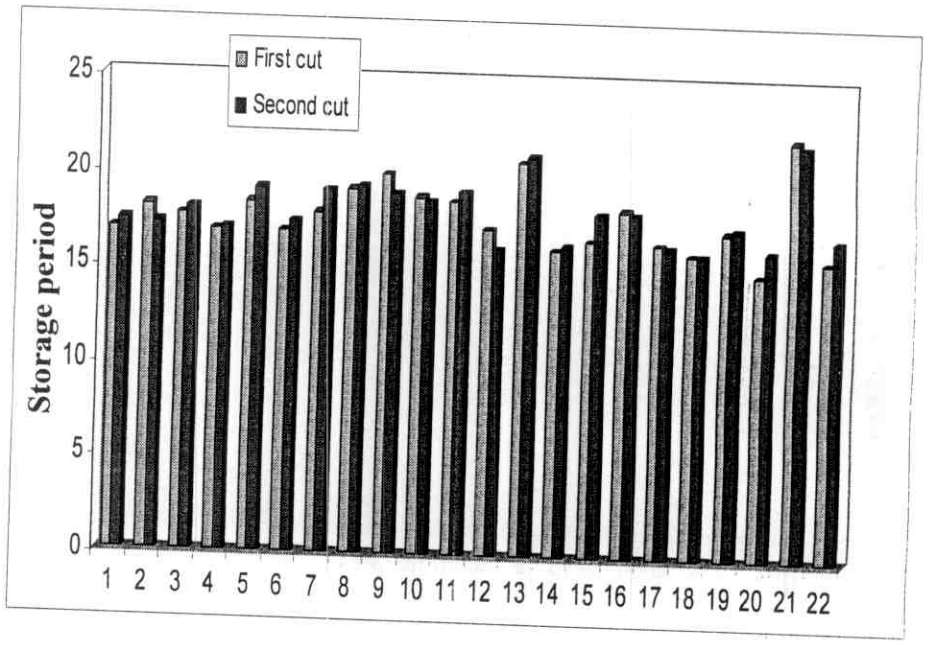


Fig. (18): Effect of mineral, organic and biofertilization on storage period (days) of *Mentha piperita*, during second season (2007 / 2008)

1. Nitr.
2. Phos.
3. Pota.
4. N
5. P
6. K
7. 100% Bio.
8. 50% Nitr. + 50% N
9. 50% Phos. + 50% P
10. 50% Pota. + 50% K
11. 50% Nitr. + 50% Bio.
12. 50% Phos. + 50% Bio.
13. 50% Pota. + 50% Bio.
14. 50% N + 50% Bio.
15. 50% P+ 50% Bio.
16. 50% K+50% Bio.
17. 75% Bio + 25% N
18. 75% Bio + 25% P
19. 75% Bio + 25% K
20. 100% (N + P + K)
21. 50% (Nitr.+Phos.+Pota.) +50% (N+P+K)
22. Control (without any fertilizers)
23. L.S.D. 5%