



EFFECT OF PLANTING DATE AND COMPOST FERTILIZATION ON FENUGREEK PLANT

Abdou¹, M.A.H - Abdel-Fatah², A.A.

1 Horticulture Department, Fac. of Agric., Minia Univ. Egypt.

2 M. Sc. Researcher.

Received: 18 August (2021) Accepted: 29 November (2021)

ABSTRACT

A field experiment was conducted during 2018/2019 and 2019/2020 seasons in Sharona Village, Eastern Desert Road, Maghagha City, Minia Governorate, to study the effect of compost fertilization levels (0.0, 5.0, 7.5 and 10.0 t/fed.) and planting dates (15th September, 1st October and 15th October), as well as their interactions on fenugreek plants performance.

The results indicated that all treatments of compost led to significant ($p < 0.05$) increase in plant height, leaves number/plant, number of pods/plant and seed yield/plant as well as protein and saponine (%) as compared with the control. The treatment of 10.0 t/fed. compost was superior than the other treatments.

Planting dates had significant ($p < 0.05$) effect on vegetative growth parameters, yields and some chemical composition. The suitable sowing date of fenugreek plants was 1st October for all previous traits.

Generally, it could be recommended that sowing fenugreek plants in 1st October and fertilizing plants with 10.0 t/fed. compost would obtain the good growth and yield productivity of fenugreek plant under Minia Governorate conditions.

INTRODUCTION

Fenugreek (*Trigoneila foenum-greecum*, L.) is an annual herbaceous plant commonly known as *methi*, belongs to the sub Family *Papilionaceae*, Family *Fabaceae*. It is used both as herb (the leaves) and as spice (the seed) (Basu *et al.*, 2014). Fenugreek seeds contain many compounds belong to glycosides and flavonoids that give the plant pigment. They are important compounds for treating diabetes, liver diseases, eye pressure protection and anemia treatments, also contain vitamins such as (A, B₁ and B₂), as well as rich in some minerals, including K, P, Ca, Mg, Fe and Mn. Also, seeds contain hormone precursors that can increase milk production in nursing mothers (Muhammed, 2017 and Meena *et al.*, 2018).

The application of organic fertilization (compost) resulted in an improvement in the growth and yield of fenugreek plant (Hegazy *et al.*, 2013; Mafakheri, 2017; Lunagariya *et al.*, 2018 and Ameziane *et al.*, 2020). Sowing date is one of the most important production factors, many authors concluded that planting date had significant effect on growth and yield of fenugreek plant (Sheorant *et al.*, 2000; Bhutia and Sharangi, 2016; Sowmya *et al.*, 2017; Kauser *et al.*, 2018 and Majid *et al.*, 2019).

Therefore, this study was to investigate the effect of sowing date and compost fertilization levels on fenugreek plant performance.

MATERIALS AND METHODS

A field experiment was conducted during 2018/2019 and 2019/2020 seasons in Sharona Village, Eastern Desert Road, Maghagha City, Minia Governorate. The seeds of fenugreek plant were obtained from the Agricultural Research Station at Sids, Beni Sueif Governorate. The experimental unit (plot) was 1.2 x 2.2 m and contained 4 rows, 30 cm apart, and seeds were cultivated in hills, 10 cm apart on one side of the row, therefore, each plot contained 80 hills and plants were thinned to two plants/hill after 2 weeks (30th September, 15th October and 30th October) from the sowing dates. The physical and chemical analysis of the used soil were presented in Table (1).

Table 1: Physical and chemical analysis of the used soil during the two seasons of 2018/2019 and 2019/2020.

| Soil character | Values | | Soil Character | Values | |
|-----------------------------|------------|------------|---|-----------|-----------|
| | 2018/2019 | 2019/2020 | | 2018/2019 | 2019/2020 |
| Physical properties: | | | Soluble cations (mg/100 g soil): | | |
| Sand (%) | 63 | 61 | Ca ⁺⁺ | 1.16 | 1.21 |
| Silt (%) | 16 | 16 | Mg ⁺⁺ | 0.95 | 0.98 |
| Clay (%) | 21 | 23 | Na ⁺ | 0.52 | 0.55 |
| Soil type | Sandy loam | Sandy loam | K ⁺ | 0.09 | 0.08 |
| Chemical properties: | | | Soluble anions (mg/100 g soil): | | |
| pH (1:2.5) | 8.33 | 8.34 | Cl ⁻ | 0.96 | 0.98 |
| E.C. (dS/m) | 0.66 | 0.68 | HCO ₃ ⁻ | 1.04 | 1.09 |
| O.M. (%) | 0.03 | 0.03 | CO ₃ ⁻⁻ | 0.00 | 0.00 |
| CaCO ₃ (%) | 2.75 | 2.76 | SO ₄ ⁻⁻ | 0.72 | 0.75 |

The experiment was arranged in a randomized complete block design in a split-plot design with three replicates. The main plots (A) included four levels of compost (0.0, 5.0, 7.5 and 10.0 t/fed.), while the sub-plots (B) involved three planting dates treatments (15th September, 1st October and 15th October), therefore, the interaction treatments (A x B) were 12 treatments. Compost (plant residues) was obtained from Egypt Company for Circulate Solid Residues at New El-Minia City and added during preparing the soil to cultivation in both seasons. The chemical analysis of compost is shown in Table (2).

Table 2: Chemical analysis of the used compost in both seasons of 2018/2019 and 2019/2020.

| Properties | Value | Properties | Value |
|--------------------|-------|-------------|-------|
| Organic carbon (%) | 26.25 | Total P (%) | 0.4 |
| Humidity (%) | 25 | Total K (%) | 1.0 |
| Organic matter | 44 | Fe (ppm) | 1740 |
| C/N ratio | 17.5 | Zn (ppm) | 58 |
| pH (1:2.5) | 8.0 | Mn (ppm) | 130 |
| E.C. (m. mhos/cm.) | 4.5 | Cu (ppm) | 189 |

| | | | |
|-------------|-----|--|--|
| Total N (%) | 1.5 | | |
|-------------|-----|--|--|

The end of the growth seasons was at 1st April, 15th April and 1st May for the first, second and third sowing date, respectively.

Data recorded: vegetative growth (plant height and number of leaves/plant), yield components (number of pods/plant and seeds yield per plant) as well as chemical composition (protein and saponine %) were evaluated.

- Saponin (%) determination:

After oil extraction by Soxhlet apparatus, 0.1 g of the defatted residue was collected in a falcon centrifuge tube where 3 ml methanol was added and left overnight on the shaker, followed by centrifugation. The same extraction procedure was done twice more. At the end, supernatant of methanol extracts of the three extraction times were pooled together and the solvent was evaporated by rotary evaporator. A yellowish crystal powder was finally which contained the crude saponins which was spectrophotometrically determined according to the method described by *Baccou et al. (1977)*.

- Protein (%) determination:

The percentage of N in the seeds was measured according to *Page et al. (1982)*, then the values were multiplied by 6.25.

The obtained data were tabulated and statistically analyzed according to *MSTAT-C (1986)*, and LSD test at 5% was followed to compare between the means of treatments.

RESULTS AND DISCUSSION

Vegetative growth:

Obtained data in Table (3) indicated that fertilizing fenugreek plants with compost at 5.0, 7.5 and 10.0 t/fed. led to significant ($P < 0.05$) increase in both plant height and leaves number/plant comparing to control plants. The addition of high level of compost (10.0 t/fed.) recorded the tallest plants (78.7 and 80.0 cm) in both seasons, respectively, and the highest number of leaves (50.7 and 51.1 leaves/plant) in the first and second seasons, respectively. These results agree with many authors who reported that compost supplied fenugreek plant with good nutrition (*Biswas and Anusuya, 2014; Jasim et al., 2016; and Balakrishnan and Arunprasath, 2018*).

Results in Table (3) revealed that plant height and leaves number/plant were differed according to the difference in sowing date in both seasons. Planting fenugreek on 1st October gave the tallest plants (73.8 and 83.0 cm in both seasons) and the highest number of leaves (50.65 and 50.98 leaves/plant) in the first and second seasons, respectively. *Sultana et al. (2016); Kauser et al. (2018) and Majid et al. (2019)* proved that the suitable sowing date augmented good vegetative growth of fenugreek plants.

The interaction between the two was significant ($P < 0.05$) for plant height and leaves number/plant in the both seasons. The best interaction treatment was the second planting date (1st October) in combination with compost of 10.0 t/fed. or 7.5 t/fed. in both seasons.

Table (1): Effect of compost, planting dates and their interactions on plant height and leaves number/plant of fenugreek during 2018/2019 and 2019/2020 seasons.

| Planting dates | Compost levels (ton/feddan) (A) | | | | | | | | | |
|----------------|---------------------------------|-----|-----|------|----------|-----|-----|-----|------|----------|
| | 0.0 | 5.0 | 7.5 | 10.0 | Mean (B) | 0.0 | 5.0 | 7.5 | 10.0 | Mean (B) |
| | | | | | | | | | | |

| | 1 st season (2018/2019) | | | | | 2 nd season (2019/2020) | | | | |
|----------------------------------|------------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|------------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Plant height (cm) | | | | | | | | | | |
| 15th September | 44.0 | 54.1 | 74.8 | 77.1 | 62.6 | 54.2 | 55.1 | 66.6 | 71.1 | 61.8 |
| 1st October | 63.7 | 67.0 | 81.3 | 83.0 | 73.8 | 71.9 | 83.1 | 86.2 | 90.8 | 83.0 |
| 15th October | 56.3 | 71.9 | 72.9 | 75.9 | 69.3 | 62.9 | 65.8 | 73.2 | 78.1 | 70.0 |
| Mean | 54.7 | 64.3 | 76.3 | 78.7 | | 63.0 | 68.0 | 75.3 | 80.0 | |
| L.S.D at 5% | A: 2.5 | | B: 2.0 | | AB: 4.0 | A: 2.9 | | B: 2.2 | | AB: 4.4 |
| Leaves number/plant | | | | | | | | | | |
| 15th Sept. | 45.1 | 46.8 | 48.1 | 49.1 | 47.2 8 | 45.3 | 46.5 | 48.8 | 49.9 | 47.6 3 |
| 1st October | 48.3 | 70.0 | 51.6 | 52.7 | 50.6 5 | 48.6 | 50.1 | 52.3 | 52.9 | 50.9 8 |
| 15th October | 46.2 | 47.9 | 49.3 | 50.3 | 48.4 3 | 46.4 | 47.8 | 49.9 | 50.5 | 48.6 5 |
| Mean | 46.5 3 | 48.2 3 | 49.6 7 | 50.7 0 | | 46.7 7 | 48.1 3 | 50.3 3 | 51.1 0 | |
| L.S.D at 5% | A: 0.69 | | B: 0.55 | | AB: 1.10 | A: 0.85 | | B: 1.20 | | AB: 2.40 |

Yield and its components:

Data in Table (4) showed that adding compost at the three levels significantly increased pod number/plant and seed yield/plant in both seasons as compared with control. By increasing the level of compost from zero to 10.0 t/fed., pods number and seed yield/plant were raised from 27.00 to 36.00 pod/plant and from 3.431 to 7.605 g/plant in the first season, respectively; and 31.67 to 38.33 pod/plant and from 4.933 to 8.888 g/plant in the second season, respectively. Application of compost may be enhanced the availability of N, P and K in the soil as a major plant nutrients. Our results on fenugreek are in agreement with those obtained by Godara *et al.* (2012); Alaghemand *et al.* (2017) and Sahu *et al.* (2020).

Table (4): Effect of compost, planting dates and their interactions on pods number/plant and seed yield/plant of fenugreek during 2018/2019 and 2019/2020 seasons.

| Planting dates treatments | Compost levels (ton/feddan) (A) | | | | | | | | | |
|----------------------------------|------------------------------------|--------------|-----------------|--------------|------------------|------------------------------------|--------------|-----------------|--------------|------------------|
| | 0.0 | 5.0 | 7.5 | 10.0 | Mean (B) | 0.0 | 5.0 | 7.5 | 10.0 | Mean (B) |
| | 1 st season (2018/2019) | | | | | 2 nd season (2019/2020) | | | | |
| Pods number/plant | | | | | | | | | | |
| 15th September | 22 | 25 | 27 | 30 | 26.0 | 27 | 30 | 31 | 34 | 30.5 |
| 1st October | 31 | 33 | 36 | 40 | 35.0 | 37 | 39 | 41 | 42 | 39.8 |
| 15th October | 28 | 32 | 35 | 38 | 33.3 | 31 | 34 | 36 | 39 | 35.0 |
| Mean | 27.0 | 30.0 | 32.7 | 36.0 | | 31.7 | 34.3 | 36.0 | 38.3 | |
| L.S.D at 5% | A: 1.11 | | B: 0.91 | | AB: 1.82 | A: 1.00 | | B: 1.20 | | AB: 2.40 |
| Seed yield/plant | | | | | | | | | | |
| 15th September | 2.015 | 3.474 | 4.469 | 5.541 | 3.875 | 3.177 | 4.147 | 5.859 | 6.680 | 6.105 |
| 1st October | 4.364 | 5.951 | 7.546 | 10.273 | 7.034 | 7.235 | 8.483 | 9.818 | 11.091 | 12.865 |
| 15th October | 3.914 | 5.611 | 6.466 | 7.179 | 5.793 | 4.388 | 5.893 | 7.704 | 8.892 | 8.178 |
| Mean | 3.431 | 5.012 | 6.160 | 7.605 | | 4.933 | 6.174 | 7.794 | 8.888 | |
| L.S.D at 5% | A: 1.038 | | B: 1.075 | | AB: 2.150 | A: 1.090 | | B: 0.650 | | AB: 1.210 |

Regarding the effect of planting date, data in Table (4) showed significant ($P < 0.05$) differences among the three planting dates for pod number/plant and seed yield/plant in both seasons. The second planting date (1st October) was superior than the other two planting dates. This might be due to favourable environmental conditions available to the crop that was sown in 1st October as compared to the other two planting dates.

Many researchers proved that suitable sowing date increased the number of pod/plant and seed yield/plant such as *Farhad et al. (2015)*; *Anitha et al. (2018)* and *Majid et al. (2019)* on fenugreek plant.

The best overall treatment was the interaction of planting fenugreek in 1st October and fertilized plants with 10.0 t/fed. compost.

Chemical composition:

Data in Table (53) clarified that the treatments of 5.0, 7.5 and 10.0 t/fed. compost significantly ($P < 0.05$) increased both of protein and saponine (%) as compared with control, with the best treatment of 10.0 t/fed. compost. These results are in harmony with those recorded by *Ahmed et al. (2012)*; *Naimuddin et al. (2014)*; *Anitha et al. (2015)*; *Mufti et al. (2017)*; *Alaghemand et al. (2017)*; *Balakrishnan and Arunprasath (2018)* and *Abdul-Hafeez (2019)* on fenugreek plants.

In respect to the effect of planting dates, data in Table (3) showed that planting dates had significant differences for the percentages of protein and saponine of fenugreek seeds. The greatest percentages resulted from plants sown in 1st October as compared with the other two treatments. Similar results on fenugreek plants were obtained by *Obour et al. (2015)* and *Sowmya et al. (2017)*.

The interaction treatments were significant ($P < 0.05$) for protein and saponine (%) in both seasons. The highest percentages were obtained when sowing fenugreek in 1st October and fertilized with compost at 10.0 t/fed. Conclusively, it was preferable from the above results that, planting fenugreek plant in 1st October and fertilized it with compost at 10 t/fed. played an important role in improving growth, yield and chemical constituents of fenugreek plants. Therefore, the present study strongly admit the use of such treatment to provide good and high exportation characteristics due to its safety role in human health.

Table (5): Effect of compost, planting dates and their combinations on protein and saponine (%) in fenugreek seeds during 2018/2019 and 2019/2020 seasons.

| Planting dates treatments | Compost levels (ton/feddan) (A) | | | | | | | | | |
|----------------------------|------------------------------------|--------------|-------------|-------------|-------------|------------------------------------|--------------|-------------|-------------|-------------|
| | 0.0 | 5.0 | 7.5 | 10.0 | Mean (B) | 0.0 | 5.0 | 7.5 | 10.0 | Mean (B) |
| | 1 st season (2018/2019) | | | | | 2 nd season (2019/2020) | | | | |
| Protein (%) | | | | | | | | | | |
| 15 th September | 24.1 | 24.6 | 25.1 | 25.8 | 24.9 | 24.2 | 24.6 | 25.1 | 25.7 | 24.9 |
| 1 st October | 25.3 | 26.0 | 26.8 | 26.7 | 26.2 | 25.8 | 26.4 | 27.1 | 27.9 | 26.8 |
| 15 th October | 24.9 | 25.5 | 26.1 | 26.4 | 25.7 | 25.1 | 25.6 | 26.1 | 26.8 | 25.9 |
| Mean | 24.77 | 25.37 | 26.0 | 26.3 | 24.9 | 25.03 | 25.53 | 26.1 | 26.8 | |
| L.S.D at 5% | A: 0.2 | | B: 0.2 | | AB: 0.4 | A: 0.5 | | B: 0.4 | | AB: 0.8 |
| Saponine (%) | | | | | | | | | | |
| 15 th September | 4.1 | 4.2 | 4.3 | 4.4 | 4.25 | 4.0 | 4.3 | 4.3 | 4.5 | 4.28 |
| 1 st October | 4.3 | 4.6 | 4.8 | 5.3 | 4.80 | 4.4 | 4.7 | 4.9 | 5.4 | 4.90 |
| 15 th October | 4.2 | 4.4 | 4.3 | 4.6 | 4.43 | 4.0 | 4.4 | 4.6 | 4.7 | 4.43 |
| Mean | 4.20 | 4.40 | 4.53 | 4.77 | | 4.13 | 4.47 | 4.60 | 4.87 | |
| L.S.D at 5% | A: 0.13 | | B: 0.12 | | AB: 0.24 | A: 0.12 | | B: 0.11 | | AB: 0.22 |

REFERENCES

- Abdul-Hafeez, E.Y. (2019):** Exogenous application of potassium dihydrogen orthophosphate and sowing dates enhance fruit yield and essential oil of *Coriandrum sativum*, L. Scientific J. Flowers & ornamental plants, 8 (1): 180-194.
- Ahmed, A.G.; EL-Housini, E.A.; Hassanein, M.S. and Zaki, N.M. (2012):** Influence of organic and bio-fertilizer on growth and yield of two fenugreek cultivars grown in sandy soil. Australian Journal of Basic and Applied Sciences, 6 (10): 469-476
- Alaghemand, S.; AYYUBI, H.; Hasanpour, E.; Olfati, J.A.; Saadatian, M.; Hamidoghli, Y.; Kazemi, S. and Karimi, H. (2017):** Effects of organic fertilizers on growth and biochemical characteristics of fenugreek. Acta agriculturae Slovenica, 109 (2): 197-203.
- Ameziane, H.; Nounah, A. and Khamar, M. (2020):** Olive pomace compost use for fenugreek germination. *Agronomy Research* 18 (3), 1933-1943.
- Anitha, B.; Reddy, M.L.N.; Dorajee Rao, A.V.D.; Kiran patro, T.S.K.K. and Salomi Suneetha, D.R. (2018):** Performance of fenugreek cultivars for growth and seed yield. Int. J. Pure App. Biosci., 6 (6): 271-277.
- Anitha, M.; Swami, D.V.; Salomi Suneetha D.R. (2015):** Seed yield and quality of fenugreek (*Trigonella foenum-graecum* L.) cv. Lam methi-2 as influenced by integrated nutrient management. The Bioscan, 10 (1): 103-106.
- Baccou, J.C.; Lambert, F. and Sauvaire, Y. (1977).** Spectrophotometric method for the determination of total steroidal saponin. Analyst, Jwze, 102: 458-465.
- Balakrishnan, M. and Arunprasath, A. (2018):** Impact of plant growth regulators and organic fertilizer on growth and biochemical composition of *Trigonella foenum-graecum* L. International Journal of Botany Studies, 3 (3): 24-28.
- Basu, A.; Basu, S.K.; Kumar, A.; Sharma, M.; Chalghoumi, R.; Hedi, A.; Solorio-sanchez, F.; Bologum, M.O. Hafiz, EE. And Cetzal, I.X. (2014):** Fenugreek of (*Trigoneila foenum-greecum*, L.) a potential new crop for Latin America, Am. J. Soc., Issue Hum, 4 (3): 145 – 162.
- Bhutia, P.H. and Sharangi A.B. (2016):** Effect of dates of sowing and soil moisture level in different growth stages and yield dynamics of fenugreek (*Trigonella foenum-graecum* L.). Natl. Acad. Sci. Lett. (March–April), 39 (2): 77–80. DOI 10.1007/s40009-016-0428-2.
- Biswas, S. and Anusuya, D. (2014):** Effect of bioinoculants and organic manure (Phosphocompost) on growth, yield and nutrient uptake of *Trigonella foenum-graecum* L. (fenugreek). International Journal of Science and Research (IJSR), Volume 3 Issue 8, August, 38-41.
- Farhad, I.Md.; Bhowmik, S.K., Md. Amir Faisal, A.Md. (2015):** Effect of variety and planting time on the productivity of fenugreek in coastal area. World Journal of Agricultural Sciences 11 (3): 164-168.
- Godara, A.S.; Gupta, U.S.; Singh, R. and Mehta, R.S. (2012):** Effect of different combinations of organic and inorganic nutrient sources on productivity and profitability of fenugreek (*Trigonella foenium-graecum*). International J. Seed Spices 2 (2): 34-37.

- Hegazy, M.I.; Ali S.A. and Abbas, E.E.A. (2013):** Evaluation of compost and compost extract efficiency as bio-control agents on damping-off disease incidence of fenugreek (*Trigonella foenum-graecum*). Zagazig J. Agric. Res., Vol. 40 No. (2): 239-249.
- Jasim, H.A.; Ayad H.A. and LILO, S.A. (2016):** Effect of organic and chemical soil fertilizers and their interactions with foliar fertilizer on some vegetative growth of fenugreek. *Annals of West University of Timișoara*, ser. Biology, 19 (2):199-206
- Kauser, H.; Bhoomika, H.R. and Ibaad, M.H. (2018):** Interaction effects of different sowing dates and stage of pinching on growth, yield and economics of fenugreek (*Trigonella foenum – graecum* L.). *Int. J. Pure App. Biosci.* 6 (2): 167-171.
- Lunagariya, D.D.; Zinzala, V.J.; Barvaliya, M.M. and Dubey, P.K. (2018):** Effect of organics on growth, yield, quality and economics of fenugreek (*Trigonella foenum-graecum* L.) grown under organic farming system. *Journal of Pharmacognosy and Phytochemistry*, 7 (3): 2420-2424.
- Mafakheri, S. (2017):** Effect of some organic and chemical fertilizers on morphological and biochemical factors of fenugreek (*Trigonella foenum-graecum* L.). *The Plant Production (Scientific Journal of Agriculture)*, 40 (3), Autumn, 27-41.
- Majid, H.A.; Salim, H.A. and Fahmi, A.H. (2019):** Effect of planting date and spraying of humic acid in the growth traits and active compounds of Fenugreek (*Trigonella foenum – graecum* L.). *IOP Conf. Ser.: Earth Environ. Sci.* 388 - 012048.
- Meena, N.K.; Meena, S.S.; Gupta, S. and Lai, G. (2018):** Influence of different dates of sowing, fertilizer level and weedicides on growth and yield of fenugreek (*Trigonella foenum-graecum* L.) under semi-arid conditions. *Int. J. Curr. Microbiol. App. Sci.*, 7 (8): 1844 – 1854.
- MSTAT–C (1986):** A microcomputer program for the design management and analysis of Agronomic Research Experiments (version 4.0), Michigan State Univ., U.S.A.
- Mufti, S.; Chattoo, M.A.; Wani, K.P.; Bhat, R.; Mushtaq, F.; Afroza, B.; Nabi, A. and Masoodi, U.H. (2017):** Carry over effect of organic manures and inorganic fertilizers on growth, yield and quality of residual crop fenugreek in brinjal-fenugreek cropping sequence. *Journal of Pharmacognosy and Phytochemistry*, 6 (6): 1883-1886.
- Muhammed, S. (2017):** Response of two fenugreek varieties to different cutting dates and nitrogen fertilizer for growth and forage yield traits under rainfed condition. *Journal Tikrit Univ. for Agric. Sci.*, vol. (17): 322 – 332.
- Naimuddin, O.P.; Aishwath, Lal, G.; Kant, K.; Sharma, Y.K. and Ali, S.F. (2014):** Response of *Trigonella foenum-graecum* to organic manures and Rhizobium inoculation in a Typic Haplustept. *Journal of Spices and Aromatic Crops*, 23 (1) : 110–114.
- Obour, A.; Obeng, E. and Holman, J.D. (2015).** Influence of different seeding dates on fenugreek (*Trigonella foenum-graecum* L.) forage yield and nutritive value. *Kansas Agricultural Experiment Station Research Reports*, vol. 1 (2), Kansas Field Research <https://newprairiepress.org/kaesrr/vol1/iss2/12>.
- Page, A. L.; Miller, R. H.; and Keeney, D. R. (1982).** *Methods of soil analysis; 2. Chemical and microbiological properties*, 2. Aufl. 1184 S., American Soc. of Agronomy (Publ.), Madison, Wisconsin, USA.

- Sahu, P.K.; Naruka, I.S.; Haldar, A.; Chundawat, R.S. and Kumar, L. (2020):** Studies on the effects of integrated nutrient management on fenugreek (*Trigonella foenum-graecum*) L. International Journal of Chemical Studies; IJCS; 8 (2): 1082-1089.
- Sheorant, R.S.; Sharma, H.C; Panuu, P.K. and Niwas, R. (2000):** Influence of sowing time and phosphorus on, phenology, thermal requirement and yield of fenugreek (*Trigonella foenum-graecum* L.) genotypes. Journal of Spices and Aromatic Crops, 9 (1): 43-46.
- Sowmya, P.T.; Naruka, I.S. ; Shaktawat, R.P.S. and Kushwah, S.S. (2017):** Effect of sowing dates and stage of pinching on growth, yield and quality of fenugreek (*Trigonella foenum-graecum* L.). International Journal of Bio-resource and Stress Management, 8 (1): 91-95.
- Sultana, S.; Das, G.; Das, B. and Sarkar, S. (2016):** Influence of dates of sowing on growth and yield dynamics of fenugreek (*Trigonella foenum-graecum* L.). International Journal of Green Pharmacy, 10 (4): 233-236.

الملخص العربي

تأثير مواعيد الزراعة والتسميد العضوي علي نبات الحلبة

محمود عبدالهادي حسن - استاذ الزينة - قسم البساتين - كلية الزراعة - جامعة المنيا.

علي أحمد عبدالفتاح

أجري هذا العمل بموسمي 2019/2018 و 2020/2019 بقرية شارونة - شرق الطريق الصحراوي الشرقي - مدينة مغاغة - محافظة المنيا، لدراسة تأثير مستوي الكمبوست (صفر - 5.0 - 7.5 - 10.0 طن/فدان) ومواعيد الزراعة (15 سبتمبر، أول أكتوبر، 15 أكتوبر) والتفاعل بينهما علي أداء نبات الحلبة.

أشارت النتائج إلي أن كل معاملات التسميد بالكمبوست أدت إلي زيادة في إرتفاع النبات، عدد الأوراق للنبات، عدد القرون/نبات، وزن البذور للنبات، والنسبة المئوية للبروتين والصابونين في البذور مقارنة بالكنترول.

مواعيد الزراعة كان لها تأثير معنوي علي كل الصفات المدروسة. وكان أنسب موعد للزراعة هو أول أكتوبر مقارنة بالمواعيد الأخرى.

يمكن التوصية: بزراعة نبات الحلبة في أول أكتوبر مع التسميد بالكمبوست بمعدل 10 طن/فدان للحصول علي نمو خضري وإنتاجية جيدة لنبات الحلبة تحت ظروف محافظة المنيا.