

Effect of seeding rates on the herbage production of disc medic (*Medicago tornata*) cv. Swani

ZAHOOR H. KHAN AND M. A. MUSBAH¹

ABSTRACT

The effect of seeding rate on the forage yield components of disc medic (*Medicago tornata*) cv. Swani was studied during 1981-82 and 1982-83 at the Experimental Farm of Faculty of Agriculture, Tripoli, Libya.

The forage and all the forage yield component except plant length were significantly affected by seeding rates during 1982-83 whereas during 1981-82, only numbers of plants/m² and fresh green weight of individual plants were significantly affected by seeding rates. The fresh green as well as oven dried forage yield (tons/ha) was increased by increasing seed rate. But the fresh green and oven dried forage yield (gr./plant) on individual plant basis decreased as the seeding rate was increased. The lowest (5.96 tons/ha in 1981-82 and 2.62 tons/ha in 1982-83) and highest (6.85 tons/ha in 1981-82 and 5.83 tons/ha in 1982-83) fresh green forage yield was obtained by sowing 5 and 20 Kg seed/ha, respectively. Similarly the lowest (1.78 tons/ha in 1981-82 and 0.91 tons/ha in 1982-83) and highest (2.39 tons/ha in 1981-82 and 2.15 tons/ha in 1982-83) oven dried forage yield was obtained at 5 and 20 Kg/ha seeding rate, respectively. But on the individual plant basis, the fresh green weight decreased from 7 to 1 gr. in 1981-82 and from 3.66 to 1.50 gr. in 1982-83 as the seeding rate was increased from 5 to 20 g/ha. Similarly the oven dried weight per plant was also decreased from 2.09 to 0.74 gr. in 1981-82 and from 1.28 to 0.35 gr. in 1982-83 when the seeding rate was increased from 5 to 20 Kg/ha, respectively. The plant length was also increased by increasing seeding rate but this increase was not significant.

INTRODUCTION

Annual medics were considered most suitable for the improvement of Libyan range lands (2, 7, 8, 19). The disc medic (*Medicago tornata*) cv. Swani as an important local winter annual legume was selected by Francis and Khalil from collections made by Roberts, Halse and Khalil from the typically fine, sandy aeoline soils 1 km. north of Swani, north west Libya (11). Then subsequent field evaluation trials were conducted by West Australian Department of Agriculture and its representatives on the Gefara Plain region of Libya (13). Khalil et al. (11). from their preliminary agronomic evaluation of disc medic (*Medicago tornata*), cv. Swani, reported that in Australia, it flowered about 2 months after germination, 4-5 days earlier than barrel medic (*Medicago truncatula*), cv. Cyprus or strand medic (*Medicago littoralis*), cv. Harbinger and some 3 weeks earlier than disc medic (*Medicago tornata*), cv. Tornafeld. The same was found true when

¹ Department of Range and Forestry, Faculty of Agriculture, University of Al-Fateh, Tripoli, Libya (S.P.L.A.J.)

tested under Libyan conditions. It established and seeded well in rainfall as low as 125 mm (3). Francis (4) made ecological studies to note the distribution of winter annual medics in Libya. He reported that disc medic (*Medicago tornata*), cv. Swani was very much restricted in distribution and seemed to be more specific to sandy soils than even the strand medic (*Medicago littoralis*), cv. Harbinger. Its range was largely confined to the coastal belt of moderate rainfall (to 175 mm). Tayler et al. (22) studied the seasonal growth patterns and effect of cutting frequency and height on yield of annual cool season legumes for forage. They concluded that disc medic (*Medicago tornata*), cv. Swani is one of the most promising cool season forage legume which gave the high production of forage over 8 weeks period. Oram (15) also reported that seedling vigour of disc medic (*Medicago tornata*), cv. Swani is twice than strand medic (*Medicago littoralis*), cv. Harbinger and barrel medic (*Medicago truncatula*), cv. Cyprus.

Seeding rate is one of the most important factors, the effect of which on growth and forage yield of annual medics cannot be underestimated (20). Poole (17) used two seed rates 6 and 60 lb/acre for the agronomic evaluation of disc medic (*Medicago tornata*), cv. Tornafield. He obtained 3890 and 4118 lb/acre dry matter yield at 6 and 60 lb/acre seed rate, respectively. The number of plants was also increased from 69 to 458/ yd² when the seed rate was also increased from 6 to 60 lb/acre, respectively. Jakob and Miller (9) reported that hay production of alfalfa (*Medicago sativa*) was twice as the seeding rate increased from 4.5 to 18 Kg/ha and number of plants/m² was almost linearly related to seeding rate. Similar results were obtained by Khankishev (12) who found in USSR that by increasing seeding rate from 12 to 24 Kg/ha, hay production was also increased from 4.2 to 5.4 tons/ha. Kassasian (10) also got a yield of alfalfa (*Medicago sativa*) hay as 21.64, 24.98 and 25.84 tons/ha by using seed rate of 10, 40 and 100 kg/ha, respectively. In addition to these, McGuire (14) also concluded that increase in forage yield of alfalfa (*Medicago sativa*) was associated with the increase in sowing rate. Pederson (16) from his studies in Utah reported that by increasing seeding rate, the weight of individual plant is decreased whereas plant height is increased. Radwan et al. (18) obtained 0.68 tons/ha dry forage yield of disc medic (*Medicago tornata*), cv. Tornafield by sowing at the rate of 8 Kg/ha whereas Amor (1) got 45.8, 4.3, 4.4, 29.6 and 23.1 Cwt/acre herbage production from strand medic (*Medicago littoralis*), cv. Harbinger during 1960, 1961, 1962, 1963 and 1964 by sowing 30 lb/acre seed each year.

Disc medic (*Medicago tornata*), cv. Swani can be very useful for Jamahiriya and should be used extensively due to its relatively early flowering and more seed production capabilities. But more appropriate seed rate is needed to extend the area potentially available for pasture improvement. Therefore, the present investigation was carried out to find out the most appropriate seeding rate of Swani under local conditions of Jamahiriya.

MATERIALS AND METHODS

A field experiment was conducted on loam sandy soil at the Experimental Farm of the Faculty of Agriculture, Tripoli, Libya, during 1981-82 and 1982-83. The disc medic (*Medicago tornata*), cv. Swani was sown with different seeding rates in the mid of November of each year in plots with an area of 2 × 2 m each in a randomized block design with three replications. The same seeding rate treatment was applied each year. The treatments were as follows,

Seeding rate treatments	Seeding Rates (Kg/ha)
1	5
2	10
3	15
4	20

A complete fertilizer (12-24-12) at the rate of 300 Kg/ha was applied at sowing time. Before seeding, the germination of the seeds was tested in laboratory each year and recorded as 90.5 and 90 per cent for first and second year, respectively. The crop was grown under rainfed conditions (Table 2). Samples for soil analysis were collected from 0-15 cm depth and analysed by Agriculture Research Centre, Tripoli, Libya (Table 1)..

Five samples at the time of harvest were sampled at random from each plot at harvest for measuring plant length and individual fresh green/oven dried weight per plant. A 1 m² area from the centre of each plot was harvested in the last week of March of each harvesting year. The fresh green forage of each plot was weighed immediately after harvesting. Samples of 100 grams each from each plot at harvest were saved and then oven dried at 70°C for 24 hours and calculated for dry forage in tons/ha. All the data were subjected to statistical analysis of variance (21).

Table 1 Soil analysis of Experimental Area for 1981-82

pH	= 7.03
O.M.	= 0.35%
P	= 9.33 (ppm)
Na	= 32.50 (ppm)
K	= 7.63 (ppm)
Ca	= 38.75 (ppm)
E.C.	= 0.52 m. mhos at 25°C
Sand	= 71.5%
Silt	= 16.50%
Clay	= 12.00%

Table 2 — Monthly rainfall at the Experimental Area, for 1981-83. in mm*

Month	1981	1983	1983
Jan.	105.6	98.6	42.0
Feb.	55.0	42.0	15.1
Mar.	8.1	52.0	21.1
Apr.	0.5	22.2	1.5
May	0.0	0.0	0.0
June	0.0	0.0	1.4
July	0.0	0.0	0.3
Aug.	0.0	0.0	0.0
Sept.	1.7	10.3	14.5
Oct.	14.1	81.0	92.2
Nov.	12.2	87.0	35.6
Dec.	26.4	92.2	

* Source: Meteorological station, Tripoli, Libya.

RESULTS AND DISCUSSION

The total forage yield (tons/ha) and forage yield components of disc medic (*Medicago tornata*), cv. Swani are presented in Table 3 and 4. The tables showed that total fresh green as well as oven dried forage yield was increased by increasing seeding rates. But from the statistical analysis, it was revealed that the increase of fresh green as well as oven dried forage was non significant in 1981-82 and significant in 1982-83. The average total fresh green forage yield was 5.96, 6.73, 6.85 tons/ha in 1981-82 and 2.62, 3.57, 4.23, 5.83 tons/ha in 1982-83 for 5, 10, 15, and 20 Kg/ha seeding rates, respectively whereas the average total oven dried forage yield for 5, 10, 15 and 20 Kg/ha seeding rate was 1.78, 2.08, 2.29, 2.39 in 1981-82 and 0.91, 1.32, 1.60 and 2.15 tons/ha in 1982-

Table 3 — Effect of seeding rates on the forage yield components of disc medic (*Medicago tornata*), cv. Swani, for 1981-82

Seeding rates (Kg/ha)	Average fresh green forage Tons/ha	Average oven dried forage Tons/ha	Average number of plants/m ²	Average fresh green forage Gr./plant	Average oven dried forage Gr./plant	Average plant length (Cm.)
5	5.96	1.78	80.00	7.00	2.09	21.83
10	6.73	2.08	173.33	4.00	1.23	29.56
15	6.76	2.29	264.00	2.33	0.85	26.30
20	6.85	2.39	315.00	1.00	0.74	31.20
Year Mean	6.58	2.14	208.08	3.58	1.23	27.22
L.S.D. (0.05)	N.S.	N.S.	45.50	2.07	N.S.	N.S.

N.S. = Non Significant

Table 4 — Effect of seeding rates on the forage yield components of disc medic (*Medicago tornata*), cv. Swani, for 1982-83

Seeding rates (Kg/ha)	Average fresh green forage Tons/ha	Average oven dried forage Tons/ha	Average number of plants/m ²	Average fresh green forage Gr./plant	Average oven dried forage Gr./plant	Average plant length (Cm.)
5	2.62	0.91	84.00	3.66	1.28	14.63
10	3.57	1.32	180.66	2.33	0.81	16.93
15	4.23	1.60	271.33	2.00	0.70	22.30
20	5.83	2.15	348.33	1.50	0.35	24.34
Year Mean	4.06	1.50	221.08	2.37	0.79	19.57
L.S.D. (0.05)	0.59	0.19	23.29	0.74	0.28	N.S.

N.S. = Non Significant

83, respectively. In both years, the lowest total green fresh forage yield (5.96 in 1981-82 and 2.62 tons/ha in 1982-83) and the highest (6.85 in 1981-82 and 5.83 tons/ha in 1982-83) was obtained with the lowest (5 Kg/ha) and highest (20 Kg/ha) seeding rate, respectively. Similarly, the lowest total oven dried forage yield (1.78 in 1981-82 and 0.91 tons/ha in 1982-83) and the highest (2.39 in 1981-82 and 2.15 tons/ha in 1982-83) was recorded for the lowest (5 Kg/ha) and highest (20 Kg/ha) seeding rate, respectively in both years. The mean total green as well as oven dried forage yield on year basis was 6.58 and 2.14 in 1981-82 and 4.06 and 1.50 tons/ha in 1982-83, respectively. The increase in forage yield of 1981-82 may be oriented to the higher amount of precipitation received in the growing season of that year (Table 2). But it is quite evident that there is a profound effect of seeding rate on the forage production in both years. The same conclusion was also drawn by Jakob and Miller (9), Kassasian (10), Khankishev (12), McGuire (14) and Poole (17).

The Number of plants/m² was significantly increased in both growing seasons by increasing seeding rates (Tables 3 and 4). The average number of plants/m² was 80, 173.33, 264.315 in 1981-82 and 84, 180.66, 271.33 and 348.33 in 1982-83 for 5, 10, 15 and 20 Kg/ha seeding rates, respectively. The minimum number of plants/m² (80 in 1981-82 and 84 in 1982-83) and the maximum (315 in 1981-82 and 348.33 in 1982-83) was obtained by sowing plants at 5 and 20Kg/ha seed rate, respectively. Many workers who obtained higher yields of forage and hay at higher seeding rates of sowing, ascribed their higher yield to the number of plants which increased with the increase of seeding rates (9, 10, 12, 14, 17). So in our studies, the higher number of plants was established due to higher seeding rate which resulted in higher production of forage yield.

The average fresh green as well as oven dried forage yield on individual plants basis was significantly decreased by the increase in seeding rate in both years (Table 3 and 4). The corresponding average fresh green weight of individual plants for 5, 10, 15 and 20 Kg/ha seeding rate was 7, 4, 2.33 and 1 gram in 1981-82 and 3.66, 2.33, 2.00 and 1.50 gram in 1982-83 and 1.5 gram in 1982-83, respectively. The lowest fresh green weight per plant (1.00 gr. in 1981-82 and 1.5 gr. in 1982-83) and the highest (7 gr. in 1981-82 and 3.66 gr. in 1982-83) was recorded for 20 and 5 Kg/ha seeding rate, respectively. Similarly, seeding rates of 5, 10, 15 and 20 Kg/ha produced average oven dried forage weight per plant as 2.09, 1.23, 0.85, 0.74 gram in 1981-82 and 1.28, 0.81, 0.70, 0.35 gram in 1982-83, respectively. Like fresh green weight, lowest oven dried weight per plant (0.74 gr. in 1981-82 and 0.35 gr. in 1982-83) and the highest (2.09 in 1981-82 and 1.28 gr. in 1982-83) were also recorded for 20 and 5 Kg/ha seeding rate, respectively. On an individual plant basis, the average fresh green as well as oven dried forage yield per plant decreased with an increase in the seeding rate. For fresh green plant weight, the differences among seeding rate treatments were significant except between 10 and 5; and 15 and 20 Kg/ha in 1981-82 and 1982-83, respectively. The same was true for oven dried forage weight per plant in 1982-83.

Plant length at harvest, in general, increased with the increase in seeding rate in both years as shown in Tables 3 and 4. From the statistical analysis, it was revealed that there was no significant effect of increasing seed rate on plant length. The average plant length was 21.83, 29.56, 26.30, 31.20 cm in 1981-82 and 14.63, 16.93, 22.30, 24.43 cm in 1982-83 for 5, 10, 15 and 20 Kg seed/ha. The shortest (21.83 in 1981-82 and 14.63 cm in 1982-83) and longest (31.20, in 1981-82 and 24.43 cm in 1982-83) plants were produced with 5 and 20 Kg seed/ha, respectively. The same trend was also observed from the findings of Pederson (16).

From these research studies, it can safely be concluded that under conditions similar to these of the present experiment, the herbage production of (*Medicago tornata*), cv, Swani can increase by increasing seeding rates up to 20 Kg seed/ha.

LITERATURE CITED

1. Amor, R.L. 1966. *Herbage and seed production of three barrel medic (Medicago truncatula) cultivars and Harbinger medic (Medicago littoralis) in the Victorian Mallee*. Aust. J. Expt. Agr. Anim. Husb. 6: 361 - 364.
2. Dumancic, D. 1979. *Results of sowing Medicago species and other range plants for range improvement in Bir Al-Ghanam grazing perimeter*. Secretariat of Agricultural Reclamation and Land Development, Gefara Plain Authority S.P.L.A.J.: 1 - 12.
3. Ewing, M. 1978. *Report on experience with cereal and medic pastures on the cereal project*. Gefara Region. 1973/74 - 1977/78.
4. Francis, C.M. 1978. *The distribution and ecology of annual Medicago species in North West Libya. A report based on plant collection tour*. Aust. Plant Introduction Reviews. 13: 3 - 14.
5. Francis, C.M. 1978. *Annual report*. Plant Research Division. W. Aust. Dep. Agr. 35 pp.
6. Gefara Development Authority. 1979. *Progress with annual medics (Medicago Spp.) in Gefara Region of Socialist Peoples Libyan Arab Jamahiriya*. Gefara Development Authority: 1 - 8.
7. Halse, N.J. 1978. *An evaluation of the Libyan cereal project as an example of Australian agricultural expertise overseas*. J. Aust. Inst. Agri. Sci. 44: 92 - 96.
8. Halse, N.J. 1982. *Annual inspection visit to cereal project, Libya*. Report for 1981-82: 1 - 7.
9. Jakob, A. and D.A. Miller. 1973. *Performance of alfalfa (Medicago sativa L.) blends consisting of long and short lived varieties*. Agron. J. 65: 222 - 225.
10. Kasasian, L. 1977. *The effect of seed rate on the yield of Hasawi alfalfa and on*

- weed infestation in the crop*. Joint Publication of Agriculture Research and Development Projects, University College, North Wales, Banger, and Ministry of Agriculture and Water, Saudi Arabia: 108 pp.
11. Khalil, M., Francis, C.M. and N.J. Halse. 1977. *Annual medicago ecotype from North West Libya*. 1. *Preliminary agronomic evaluation*. W. Aust. Dep. Agr. Tech. Bull. Series. 37.
 12. Khankishev, V.S. and T.Y.A. Baber. 1975. *Sowing rates of lucerne*. Herb. Abst. Vol. 46. Abst. No. 1576.
 13. Mackay, J.H.E. 1981. *Register of Australian herbage plant cultivars*. Aust. Herb. Plant Reg. Auth. Division of plant industries. CSIRO, Melbourne: 90-91.
 14. McGuire, W.S. 1981. *The influence of seeding rate on yield and stands of alfalfa in Oregon's Willamette Valley*. Agr. Exp. Sta. Oregon State University Bull. No. 649.
 15. Oram, R.N. 1980. *Register of Australian herbage plant cultivars. B. Legumes. 9. Annual medic. d. Medicago tornata (L) Mill (disc medic) cv. Swani*. J. Aust. Agr. Sci. 46: 136 - 137.
 16. Pederson, M.W. 1962. *Alfalfa seed production studies*. Utah Agr. Exp. Sta. Bull. No. 436.
 17. Poole, M.L. 1970. *An Agronomic evaluation of Medicago tornata cv. Tornafield, a new medic cultivar*. Aust. J. Exp. Agr. Anim. Husb. 10: 405 - 409.
 18. Radwan, M.S., A. K. Al-Fakhary and A.M. Al Hasan. 1978. *Some observations on the performance of annual medics in Northern Iraq*. Mesopotima J. agr. 13: 55 - 67.
 19. Roberts, E.J. and N.J. Halse. 1976. *Introduction of cereal/medic rotation in the Gefara Plains of the Libyan Arab. Republic*. Agr. Dev. Council. S.P.L.A.J.: 1 - 18.
 20. Silsbury, J.H., L. Adam, P. Baghast and E.D. Carter. 1979. *A quantitative examination of the growth of swards of Medicago truncatula cv. Jemalong*. Aust. J. Agr. Res. 30: 58 - 63.
 21. Steel, G.D.R. and J.H. Torrie. 1960. *Principles and procedures of statistics*. McGraw-Hill Book Company Inc. London: 99 - 131.
 22. Taylor, A.O., K.A. Hughes and B. J. Hunt. 1979. *Annual cool season legumes for forage seasonal growth patterns and effect of cutting frequency and cutting height on yield*. N. Z. J. Exp. Agr. 7: 149 - 152.

تأثير معدلات البذر على الانتاج العشبى لنبات النفل (تورناتا)

المستخلص

أجريت دراسة على تأثير معدلات البذر على الإنتاج العلفى والمحتوى الانتاجى لنبات النفل (تورناتا) بمزرعة تجارب كلية الزراعة، بجامعة الفاتح / طرابلس / ليبيا خلال الفترة 81 - 1982 م، 82 - 1983 م.

لقد تأثر المحتوى الانتاجى للأعلاف - عدا ارتفاع النبات تأثرا واضحا بمعدل البذر خلال الفترة 82 - 1983 م. بينما تأثرت أعداد النباتات فى المتر المربع فقط، والوزن الأخضر الطازج لبعض أفراد النباتات بمعدل البذر تأثرا واضحا خلال الفترة 81 - 1982 م.

إن الانتاج الأخضر الطازج لنبات النفل وكذلك الأعلاف المجففة بالفرن ازدادت (طن / هـ) بزيادة معدل البذر، الا أن الانتاج الأخضر الطازج والأعلاف المجففة بالفرن (جم / نبتة) على أساس النبات الواحد قد تناقص بزيادة معدلات البذر، وكان أكبر انتاج هو 6,85 طن / هـ خلال الفترة 81 - 1982 م و 5,83 طن / هـ خلال الفترة 82 - 1983 م. من الانتاج العلفى الأخضر الطازج، والذي تم الحصول عليه بزراعة (5) كجم، (20) كجم من البذور فى الهكتار على التوالى.

وبالمقارنة فإن أقل إنتاج مجفف تقريبا كان 1,78 طن / هـ خلال موسم 81 - 1982 م، 91،— طن / هـ خلال موسم 82 - 1983 م. وكان أكبر انتاج مجفف تقريبا هو 2,39 طن / هـ خلال موسم 81 - 1982 م. و 2,15 طن / هـ خلال موسم 82 - 1983 م. وذلك بزراعة (5) كجم و (20) كجم من البذور على التوالى.

الا أن الانتاج الأخضر الطازج، انخفض على أساس النبتة الواحدة من (7) جم الى (1) جم خلال موسم 81 - 1982 م. ومن 3,66 جم الى (1,5) جم خلال موسم 82 - 1983 م على نفس معدل البذر السابق، كما انخفض أيضا الانتاج العلفى الجاف على اساس النبتة الواحدة وذلك من 2,09 جم الى (8,74) خلال موسم 81 - 1982 م ومن 1,28 جم الى 35،— جم خلال موسم 82 - 1983 م.

كما لوحظ ازدياد طول النبتة الواحدة بزيادة معدلات البذر، الا أن هذه الزيادة ليست ذات معنى.