

Effect of different levels of phosphorus application on forage yield and yield components of disc medic, *Medicago tornata* cv. Swani

ZAHOOR H. KHAN¹

ABSTRACT

The effect of five levels of phosphorus on yield and yield components of disc medic, *Medicago tornata* cv. Swani were studied in a field experiment which was conducted on the fine sandy textured soil of the Farm of the Faculty of Agriculture, Tripoli, Libya during 1983-84.

Plant height and fresh green weight per plant were not affected by the application of phosphorus whereas number of leaves per plant and forage yield/m were significantly affected by the phosphorus application. The fresh and dry forage yield increased as the phosphorus rate was increased from 0 to 44 Kg/ha., after which, in spite of increasing phosphorus rate to 88 kg/ha, no increase, but rather a decrease, in forage yield was observed. The decrease was not significant in fresh green forage production. The maximum green forage (2124.50 gr/m) and dry forage (410 gr/m) yield was recorded by applying 44 Kg/ha of phosphorus. The treatment containing no phosphorus application gave the minimum fresh green forage (1571 gr) and dry forage (263 gr/m), respectively.

INTRODUCTION

There is a tremendous potential of fertilization for range improvement to increase livestock production and greater water use efficiency in the semi arid areas (13). Robson (12) reported that the annual species of *Medicago* originated in the areas surrounding the Mediterranean sea and have become naturalised in regions of similar climate throughout the world. He also added that phosphorus was also one of the most suitable and important contributing factors for the distribution and growth of annual medics. Annual medics were considered most suitable for the improvement of Libyan rangelands (2, 6, 7, 11). *Medicago tornata* cv. Swani was selected as an important annual legume by Francis And Khalil (9). Then subsequent field evaluation trials were conducted by the West Australian Department of Agriculture and a team in the Cereal Project in the Gefara Plains of Libya (10). Khalil et al (9) from their preliminary agronomic evaluation of disc medic reported that cv. Swani flowered about two months after germination which was approximately four to five days earlier than Cyprus barrel medic or Harbinger strand medic and three week earlier than Tornafeld disc medic in Australia. The same fact was found true when it was tested under Libyan conditions by Ewing (4). From his ecological studies, Francis (5) reported that disc medic *Medicago tornata*, cv. Swani was very much restricted in distribution and seemed to be more specific to sandy soils.

Rossister (14) on the bases of his ecological studies of the Mediterranean annual type

¹ Department of Range & Forestry, Faculty of Agriculture, University of Al-Fateh, Tripoli, Libya

pastures, reported that super phosphate had profound effects not only on the total yield and animal production of annual pastures but also affected the botanical composition of annual legumes. From his experiments in South Wales, Australia, Scott (16) demonstrated the response of barrel medic to super phosphate and concluded that rates of super phosphate and methods of its application affected the dry matter production significantly. He obtained pod production 535, 781, 749 and 741 Kg/ha by applying 0, 126, 376 and 753 Kg/ha, respectively of super phosphate. He also recommended 5 cm. deep placement of super phosphate below the soil surface as compared to top dressing where the moisture conditions are conducive for its uptake. But Donald (3) recommended the top dressing application of fertilizer for annual legumes. The erratic response of annual legumes to top dressed super phosphate was also reported by some other workers (10, 15). It is a well established fact that superphosphate has significant effects on the distribution and growth of annual medics. But the effectiveness of fertilization is determined by the rainfall amount. Amor (1) reported that medic pastures did not give positive responses to super phosphate application in the years of low rainfall, whereas, the yield due to fertilizer application increased significantly in the years of high rainfall. As revealed from the reviewed literature, most of the work related to annual medics was carried out in Australia where the climatic conditions are different from the local ones. So there was a great need to test these annual medics for fertilization under Jamarhiya conditions too. Therefore, the present research studies the response of one of the three annual medics to phosphate application under Libyan conditions.

MATERIALS AND METHODS

A field trial was carried out during 1983-84 season at the Faculty of Agriculture Farm in Tripoli, Libya, to study the response of disc medic, *Medicago tornata*, cv. Swani to different levels of phosphorus application. The concentrated super phosphate containing 21% of phosphorus was applied as a source of phosphorus. The experiment consisted of 5 levels of phosphorus application namely 0, 11, 22, 44, and 88 Kg/ha which were represented by T-1, T-2, T-3, T-4 and T-5, respectively. The area was divided into 4 blocks where the treatments were applied randomly to study their effects on the forage yield and yield components of disc medic, *Medicago tornata*, cv. Swani. Thus a randomized block design was employed. Each block was divided into 5 plots. The area of each plot was 2 × 2 M containing 3 rows 50 cm apart. Before sowing, super phosphate was placed 5 cm. deep in the soil of each plot as calculated for each plot/treatment. The crop was sown on the 2nd week of November, 1983 by seeding 20 Kg/ha viable seeds.

The crop was harvested in the middle of March, 1984. Five plants at random were taken to study the individual plant oriented characters like plant length, number of leaves, and fresh green weight, whereas, for the estimation of green and dry forage yield, leaving 50 cm. from both ends of the line, 1 meter long of the middle line was harvested. The fresh green forage was dried in the oven at 70°C until the constant weight was obtained. All the data were subjected to the analysis of variance (17).

RESULTS AND DISCUSSION

The analysis of variance and the average forage yield and yield components of disc medic, *Medicago tornata*, cv. Swani as affected by different levels of phosphorus application is presented in Table 1. The phosphorus application had no significant effect on plant length. With phosphorus application, the average plant length was 27.05 cm. which did not increase on adding phosphatic fertilizer. T-1, T-2, T-3, T-4 and T-5 gave 27.05, 26.80, 27.05, 26.25 and 26.75 cm. plant length on average bases, respectively. In T-4, when 44 Kg/ha phosphorus was applied, the plant length was reduced to 26.25 cm. This was the minimum plant length obtained as a result of phosphorus application. But

Table 1 — Effect of different levels of phosphorous on the forage yield components of disc medic, *Medicago tornata*, cv. Swani

Treatment	Rate of P Application	No. of Leaves per plant	Fresh Green Weight per plant (Gr)	Fresh Green Forage Yield gr/m	Dry Forage Yield gr/m	Plant Length (Cm.)
T-1	(0 kg/ha)	16.10	2.60	1571.00	263.55	27.05
T-2	(11 kg/ha)	14.45	2.50	1620.00	324.50	26.80
T-3	(22 kg/ha)	14.15	2.62	1772.00	361.00	27.05
T-4	(44 kg/ha)	16.35	2.52	2124.50	410.00	26.25
T-5	(88 kg/ha)	15.75	2.50	2031.00	365.00	26.75
Mean		15.36	2.55	1823.70	344.81	26.78
L.S.D. (0.05)		1.55	—	121.60	34.83	1.65

the differences between maximum and minimum plant length was not significant. There was a significant effect on the number of leaves due to phosphorus application (Table 1). T-4 and T-3 gave the maximum (16.35) and minimum (14.15), respectively of the average number of plant leaves. The response was very erratic: T-1, T-2, T-3, T-4 and T-5 gave the average number of leaves per plant as 16, 14, 14, 16 and 16, respectively. Except for the mean differences between T-2 and T-3 and T-4 & T-5, all other treatments differed with another significantly. The fresh green plant weight was not significantly affected by the phosphorus application (Table 1). T-1, T-2, T-3, T-4 and T-5 gave 2.60, 2.50, 2.62, 2.52 and 2.50 gram fresh green weight of individual plants, respectively on average bases. The fertilizer application generally resulted in reduced plant green weight. Without fertilizer application, 2.60 gram was recorded as an individual fresh green plant weight which decreased on fertilizer application in all treatments except T-3 where it increased to 2.62 gr/plant. When 22 Kg/ha phosphorus was applied, T-2 and T-5 gave the same plant weight obtained as a result of phosphorus application, T-3 gave the maximum (2.62 gr) fresh green weight per plant.

The fresh green forage yield obtained from one meter long line/row was significantly affected by phosphorus application (Table 1). T-1, T-2, T-3, T-4 and T-5 gave 1571, 1620, 1772, 2124.50 and 2031 gr/M, respectively on average bases. The fresh green forage yield increased from 1571 to 2124.50 gr when the phosphorus application was increased from 0 to 44Kg/ha. After this, the tendency was changed. The fertilizer application was increased to 88 Kg/ha of phosphorus, but the green forage yield was decreased to 2031 gr in T-5. But this yield did not differ significantly from the yield of T-4. This revealed that the fertilizer application had the profound effect on the green forage yield. T-4 and T-1 gave the maximum (2124.50 gr) and minimum (1571 gr) fresh forage yield/m, respectively. The mean differences of T-1 & T-2 and T-4 & T-5 were not found significant, whereas T-3 differed with all other treatments significantly affected by the phosphorus application (Table 1). Phosphorus application caused an increase in the dry forage yield. The dry forage yield increased from 263.55 to 410 gr/m, as the phosphorus application increased from 0 to 44 Kg/ha, respectively. After this, in spite of increasing the rate of phosphorus application to 88 Kg/ha, the dry forage yield did not increase, but rather decreased to 365.50 gr. So T-4 and T-1 like in green forage, gave the maximum (410 gr) and minimum (263.55 gr) dry forage, respectively. All treatments mean differences were found statistically significant, except in T-3 and T-5.

The results obtained revealed that forage yield increased with increasing phosphorus rate. This was similar to the results reported by Scott (16) which were obtained from barrel medic. The level of 44 Kg/ha of phosphorus was suggested as being the optimum requirement for getting high forage production on sandy soils. The band placement of fertilizer was also considered better than top dressing by Scott due to its merits. Beside this, the methods of application of the fertilizer, moisture condition for plant growth are also to be considered (1). On the bases of the results obtained from the present re-

search studies, 44 Kg/ha may also be recommended as an optimum rate of phosphorus application to get the higher forage production under Libyan conditions.

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تأثير معاملات التسميد بالسماذ الفوسفورى بمستويات مختلفة على الانتاج العلفى ومحتوياته لنبات النفل نوع تورناتا

دكتور / زهور حسين خان

المستخلص

ان تأثير خمس مستويات من التسميد الفوسفورى على الانتاج ومحتوياته لنبات النفل نوع تورناتا تمت دراستها على تربة رملية ناعمة بمزرعة كلية الزراعة / بجامعة الفاتح . . لوحظ أن ارتفاع النبات والوزن الأخضر الطازج للنبته الواحدة لم يتأثر بالتسميد الفوسفورى بينما تأثر عدد الأوراق، للنبته الواحدة والانتاج العلفى فى المتر المربع تأثراً معنوياً بالتسميد الفوسفورى .

لقد ازداد الانتاج العلفى الأخضر والجاف بزيادة معدلات التسميد الفوسفورى من صفر - 44 كيلوجرام / هـ وبعد ذلك، فبالرغم من زيادة معدل التسميد بواقع 88 كيلوجرام / هـ لم تلاحظ أية زيادة فى الانتاج بل كان هناك تناقص، الا أن التناقص فى الانتاج العلفى الأخضر ليس معنوياً وكان الحد الأقصى لانتاج الأعلاف الخضراء هو 2124,50 جرام / م وانتاج الأعلاف الجافة هو 410 جرام / م وذلك بتطبيق التسميد الفوسفورى بمعدل 44 كيلوجرام / هـ . . وعند عدم تطبيق التسميد الفوسفورى فقد تم الحصول على حد أدنى من الأعلاف الخضراء بواقع 1571 جرام / م وانتاج الأعلاف الجافة كان بواقع 263 جرام / م .