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Effect of Sowing Dates on the Performance of Crownvetch (*Coronilla varia* L.).

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ABSTRACT

A field trail was conducted in 1977 and 1978 to determine the effect of sowing dates (November, 1977 and March, 1978) and plant age on the performance of crownvetch (*Coronilla varia* L.) under local conditions. Stem length, number of leaves, fresh and dry weights of tops were higher in March sowing. There was an overall increase in forage production in March sowing, consequently an overall increase in the carbohydrate components of the forage which are the most important fraction for producing bulky feeds for animals. March sowing produced forage with acceptable level of crude protein, crude fibre, nitrogen free extract and mineral matter. Therefore, it is recommended to sow crownvetch seeds in March. Such a practice would greatly increase the forage yield and nutrient content.

Plants of 336 days old produced a greater forage crop than those of 215 days old. But younger plants contained higher percentages of crude protein, crude fat, nitrogen free extract and mineral matter.

INTRODUCTION

Crownvetch (*Coronilla varia* L.) is a hardy, long-lived perennial, herbaceous legume that spreads by creeping underground rootstocks (2, 3, 11, 14, 15, 19). The leaves have a superficial resemblance to the true vetches (11, 14). Beard (2) stated that the stems are leafy, hollow and weak, which impairs the climbing tendency. The stems on top of the ground reach a length of 10 feet or more (2, 18). The root system is extensive, multibranched and deep. It is highly valued for soil improvement, erosion control, and similar uses along roadsides and other steep slopes that cannot be mowed (2, 12). An additional benefit is a pleasing appearance when in full flower (2, 18, 19).

Attention has been drawn to its potentiality as a forage crop (3, 4, 5, 8, 11, 12, 14, 20). The hay is similar to that of other forage legumes in protein and fibre content (14).

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Friedman (8) reported that crownvetch produced beef gains comparable to good alfalfa pasture. Among the many advantages crownvetch seems to possess are exceptional vigor under extreme drought and cold conditions, resistance to many common diseases and insects, and a remarkable ability to grow well even on subsoil (9, 10, 11, 18, 19, 21, 22). Crownvetch is quite competitive and chockes out undesirable plants. Maintenance is at a minimum since stands tend to improve with age (9, 11, 17). Many researchers have conducted studies on this plant and suggested that it is one of the most promising plant to control erosion to come along (7, 9, 11, 17, 18).

Although crownvetch is a native to middle and southern Europe, the Middle East, and North Africa (11, 14), yet according to the available data it appears that it had never been cultivated in Jamahiriya. The objective of this investigation was to study the performance of crownvetch under local conditions.

MATERIALS AND METHODS

The experiment was conducted in 1977 and 1978 at the experimental farm of the Faculty of Agriculture, Alfateh University, Tripoli, (S.P.L.A.J.). Penngift crownvetch variety was used in this experiment. The seeds were imported from U.S.A. in 1977, and were inoculated with rhisobium prior to planting. A randomized complete block design with six replications, and two sowing dates (November 15, 1977 and March 16, 1978) were used. Plot size was 1 by 2 meters with 8 rows. Seeding rate was 60 grams/plot (300 kg/ha). Superphosphate (16% P_2O_5) was applied at the rate of 160 grams/plot (800 kg/ha) before sowing. Sprinkler irrigation was followed whenever needed uniformly to all plots. Growth parameters were determined on 10 plants taken at random from each plot. For the plants sown on November 15, 1977, the data were recorded twice — June 18 and October 17, 1978 — 215 and 336 days after sowing, respectively. The data for the plants sown on March 16, 1978 were recorded after 215 days from sowing date.

The studied characteristics were stem length, number of leaves, and fresh and oven dried weights of tops. The data were analysed by the standard analysis of variance. The percentage of crude protein ($N \times 6.25$), crude fat, crude fibre, nitrogen free extract, and mineral matter for the oven dried samples of tops were determined by the Weende method as described in the A.O.A.C. (1), and were statistically analysed after angle transformation.

RESULTS AND DISCUSSION

I. The effect of sowing date

In both sowing dates — November 15, 1977 and March 16, 1978 — data were recorded 215 days after seed sowing. Table 1 shows the effect of sowing date on stem length, number of leaves, fresh and dry weights of tops. Date of sowing highly significantly affected the stem length, plants sown in March were taller than those which were sown in November, the average plant height was 76.11 cm for the former and 27.06 cm for the latter. The greater number of leaves (31.20) was obtained from the plants of the second sowing date, it was only 21.37 for the plants of the first sowing date.

In both sowing dates — November 15, 1977 and March 16, 1978 — data were than the tops of the plants sown in November (9.96 gm). Also, the average dry weight

Table 1 The effect of sowing date on the average stem length, number of leaves, fresh and dry weights of tops of crownvetch plants (*Coronilla varia* L.).

	Stem length cm	Number of leaves	Fresh weight of tops (gm)	Dry weight of tops (gm)
November 15 (First sowing)	27.06	21.37	9.96	1.89
March 16 (Second sowing)	76.11	31.20	23.30	6.09
L.S.D. (0.05)	11.98	8.08	5.28	1.30

of tops was highly significantly greater for the plants sown in March, than those of November. The average weights of the tops of November and March sowings were 6.09 and 1.89 gm, respectively.

Table 2 shows the effect of sowing date on the percent crude protein, crude fat, crude fibre, nitrogen free extract, and mineral matter. Sowing date had no significant effect on the content of crude protein. The percentages of crude fat, nitrogen free extract and mineral matter were very significantly higher for the plants of the first sowing date than those of the second sowing date, while the crude fiber was higher in the plants sown in March than those sown in November.

Table 2 Means and angle transformed means of percentages of crude protein, crude fat, crude fibre, nitrogen free extract, and mineral matter of November and March sowings.

Sowing date	Crude protein		Crude fat		Crude fibre		Nitrogen free extract		Mineral matter	
	T. Mean	%	T. Mean	%	T. Mean	%	T. Mean	%	T. Mean	%
November 15 (1st sowing)	23.62	16.05	11.29	3.85	24.81	17.64	44.28	48.71	21.76	13.78
March 16 (2nd sowing)	22.71	14.95	9.65	2.79	32.60	29.00	39.40	40.31	19.17	10.82
L.S.D. 0.05	N.S.	—	0.85	—	1.19	—	2.89	—	1.82	—

According to the results and data obtained from this study, it appeared that sowing crownvetch seeds in March, was better than November. Crownvetch seeds sown in March produced better herbage yield with almost the same crude protein content in the tops, but had less crude fat, nitrogen free extract and mineral matter and contained higher crude fibre than those sown in November. There was an overall increase in forage production in March sowing and consequently an overall increase in the carbohydrate components of the forage which are the most important fraction for producing bulky feeds for animals (16). The total carbohydrates (crude fibre + nitrogen free extract) in November sowing was 66.35% and that of March sowing was 69.31%. Therefore, it appears that it is an advantage to sow crownvetch seeds in March. However, the nitrogen free extract was significantly higher in November sowing with a similar significant decrease in crude fibre content. In any roughage less than 18% crude fibre is considered relatively low according to the standard good roughages (6). March sowing appears to produce forage with acceptable level of crude protein, crude fibre, nitrogen free extract and mineral matter (16). The crude fat content of both sowings is almost similar to other legumes produced for ruminant feeding (8, 14).

Table 2 Effect of set size on the percentage of stand, average number of sprouts, and average weight of marketable yield of onion during 1976–1977 and 1977–1978 in Tripoli.

	1976–1977				1977–1978			
Treatment	T. mean	Stand %	Average number of sprouts	Average weight of marketable yield Tons/ha	T. mean	Stand %	Average number of sprouts	Average weight of marketable yield Tons/ha
Small sets	72.93	91.4	1.04	11.175	74.13	92.5	1.01	7.500
Medium sets	73.82	92.2	1.31	7.446	80.04	97.0	1.05	4.093
Large sets	73.29	91.7	2.49	1.175	76.89	94.8	1.58	2.435
F	0.137	—	77.280**	28.425**	3.197	—	108.605**	5.518*
L.S.D. .05	n.s.	—	0.30	3.271	n.s.	—	0.11	3.335

L.S.D. .05 set size × year = 1.095 for marketable yield.
L.S.D. .05 set size × year = 0.18 for average number of sprouts.
* = significant (at 5% level).
** = highly significant (at 1% level).
n.s. = not significant.

weight of marketable yield in tons per hectare that resulted from planting small, medium, and large sets during 1967–1977 and 1977–1978 seasons. There were no significant differences in percent stand among the three sizes of sets. With respect to number of sprouts, it was significantly increased as the size of sets was increased during the 1976–1977 season. In 1977–1978 season, there was no significant difference between the average number of sprouts that resulted from small and medium sets, but both were significantly lower than that resulted from large sets (Table 2).

With respect to average weight of marketable yield, Table 2 showed that in 1976–1977 season it was 11.175, 7.446, and 1.175 tons per hectare from small, medium, and large sets, respectively. The differences between them were significant. During 1977–1978 season average weight of marketable yield was 7.500, 4.093, and 2.435 tons per hectare, respectively. Marketable yield resulted from small sets was significantly higher than that produced by medium and large sets, but the difference between medium and large sets was not significant.

In the combined analysis, the interaction between set size and year had significantly affected the average number of sprouts and weight of marketable yield. The highest weight of marketable yield and the lowest number of sprouts were produced by small sets in both years.

The data of the present study indicated that both seasons 1976–1977 and 1977–1978 showed a similar trend. In both seasons as set size increased, the weight of marketable yield and the percentage of single bulbs decreased and the percentage of bolters and average number of sprouts increased. The percentage of doubles among non-bolters and percentage of stand remain almost constant. Large sets produced a higher percentage of bolters and a greater number of sprouts than those produced by either medium or small sets. This is expected because plants resulting from large and medium sets would be larger in size, and with their exposure to cold temperature for a reasonable period of time during winter they develop seedstalks. This phenomenon was explained by Jones and Mann (4). Bolting has been a major problem in onion production from sets. Therefore, bolting must be reduced to a minimum. In the present study planting small sets of Giza Synthetic cultivar at a specific time has significantly reduced the amount of bolting under Libyan conditions. Since the average number of sprouts increases as set size increases, it would be expected that the percentage of doubles increases with the increase in set size. But the differences between the percentages of doubles in the present study were not significant. This may be explained on the basis that doubled bolters were not included among doubles, and may be many bolters were doubles but counted as bolters only.

Evidently, medium and large size of sets — as compared with small size — tend to reduce weight of marketable yield and percentage of single bulbs through the production of a high percentage of bolters.

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II. The effect of plant age

Table 3 summarizes the effect of plant age on plant growth as indicated by stem length, number of leaves, fresh and dry weights of tops. The plants of 336 days old were highly significantly taller than the plants of 215 days old (plants were sown on November 15, 1977) the average length of the former was 108.99 cm while it was 27.06 cm for the latter. Plant age affected significantly the number of leaves, and fresh and oven dry weights of tops of crownvetch plants (Table 3).

Table 3 The effect of plant age on stem length, number of leaves, fresh and dry weights of tops of crownvetch plants.

Plant age	Stem length (cm)	Number of leaves	Fresh weight of tops (gm)	Dry weight of tops (gm)
1. 215 days	27.06	21.37	9.96	1.89
2. 336 days	108.99	34.17	26.15	6.98
L.S.D. (0.05)	18.08	6.28	10.14	1.88

Since crownvetch is used as a forage crop (3, 4, 5, 8, 11, 12, 14, 20) it was of interest to study the effect of plant age on the nutrient content of the plants. Data in Table 4 showed that the plants of 215 days old had very significantly higher percentages of crude protein (16.05%), crude fat (3.85%), nitrogen free extract (48.71%), and mineral matter (13.78%) than the plants of 336 days old. As it was expected the plants of 336 days old contained a higher percentage of crude fiber (33.16%).

Table 4 Means and angle transformed means of percentage of crude protein, crude fat, crude fibre, nitrogen free extract and mineral matter of crownvetch plants 215 and 336 days after sowing.

Plant age	Crude protein		Crude fat		Crude fibre		Nitrogen free extract		Mineral matter	
	T. mean	%	T. mean	%	T. mean	%	T. mean	%	T. mean	%
1. 215 days	23.62	16.05	11.29	3.85	24.81	17.64	44.28	48.71	21.76	13.78
2. 336 days	20.32	12.08	9.51	2.72	35.13	33.16	38.25	38.31	18.17	9.74
L.S.D. 0.05	1.38	—	1.10	—	1.89	—	1.85	—	1.40	—

According to the obtained results it could be concluded that the plants sown in March produced better herbage yield with almost the same crude protein content in the tops, but had less crude fat, nitrogen free extract and mineral matter and contained higher crude fibre than those sown in November. Plants of 215 days old had higher nutrient value than those of 336 days, but the later had greater forage production.

Further field trials would be needed to evaluate the success of crownvetch for roadside erosion control and as a forage under Libyan conditions.

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تأثير ميعاد الزراعة على نمو نبات الكرونفتش

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المستخلص

أجريت هذه التجربة خلال عامى ١٩٧٧ ، ١٩٧٨ لدراسة تأثير مواعيد الزراعة (نوفمبر ١٩٧٧ ومارس ١٩٧٨ م) والعمر على نمو نبات الكرونفتش (Coronilla varia L.) تحت الظروف المحلية . وقد دلت النتائج على أن النباتات التي زرعت في شهر مارس كانت أفضل في صفات طول الساق ، وعدد الأوراق والوزن الرطب والجاف للمجموع الخضرى للنبات ، وبالتالى كان إنتاجها أعلى في الكربوهيدرات التي تعتبر المكون الرئيسي لعلف الحيوان . كذلك فإن النباتات المزروعة في شهر مارس احتوت على نسبة مرضية من البروتين ، الألياف ، النيتروجين ، والمواد المعدنية . وعلى ما سبق فإنه ينصح بزراعة نبات الكرونفتش في شهر مارس ، إذ أن ذلك سيؤدى إلى زيادة في المحصول وارتفاع قيمته الغذائية . وقد وجد أيضا أن قطع النباتات بعد ٣٣٦ يوما من الزراعه يؤدى إلى محصول أكبر مع قيمة غذائية أقل ، وذلك بالمقارنة بالمحصول والقيمة الغذائية للنباتات التي قطعت بعد ٢١٥ يوما من الزراعة .