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EFFECT OF SOWING DEPTH ON SEEDLING EMERGENCE OF THREE SPECIES OF STYLOSANTHES

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SUMMARY

Interrelationships between sowing depths and emergence of *Stylosanthes* cultivars were investigated on two soils, one a basalt and the other a granite-derived soil.

On both soils emergence of all cultivars was greater from 0·25 and 0·50 in. sowing depths. On the granitic soil emergence of fine-stem stylo and Townsville lucerne from 0·25 in. was superior to that from 0·50 in. depth of sowing.

In the time taken to reach 50% emergence, there was no response to sowing depths of 0·25 in. and 0·50 on basalt. On granite, emergence was slower from 0·50 in. than from 0·25 in.

I. INTRODUCTION

In order to develop establishment techniques for fine-stem stylo (*Stylosanthes* sp.) an experiment was conducted at the "Brian Pastures" Pasture Research Station, near Gayndah, in south-eastern Queensland. The effects of sowing depth on seedling emergence of this cultivar and of two other widely used species of the same genus—stylo (*Stylosanthes guyanensis* (Aubl.) Sw.) and Townsville lucerne (*Stylosanthes humilis* H.B.K.)—were determined.

Various authors have made recommendations for sowing stylo. Graham (unpublished 1960) recommended cultivation and seed drilling between 0·25 in. and 0·50 in. depth to counteract seed-harvesting ants. Miles (1949) showed that seedling establishment from surface-sown seed was improved when cultivation formed part of the seedbed preparation. Foster (1961), working in the Northern Guinea Savannah zone of Nigeria, obtained stylo establishment apparently superior to that on untreated native pastures by surface-sowing both hoe-cultivated strips and grooves scratched with a stick through the native pasture.

Having experienced poor establishment from seed sown in front of a cultivator, both Shaw (1961) and Graham (1963) emphasized the importance of sowing Townsville lucerne on the surface of the cultivated soil. However, Graham stated that establishment was improved by rolling seed sown on the surface of cultivation. Norman (1960) made a series of Townsville lucerne sowings on the surface after cultivation, followed by hand-raking. He recorded lower seedling density counts where sowing was followed by intense rain and attributed this to run-off and burial of seed.

Despite these observations and recommendations, no record of critical examination of the depth of sowing of stylo or Townsville lucerne has been sighted.

II. MATERIALS AND METHODS

Seed of stylo, Townsville lucerne and fine-stem stylo (*Stylosanthes* sp. C.P.I. 11493) was used. Seed was treated against hard-seededness by steeping in water which was allowed to cool for 40 min. at room temperature from an initial temperature of 80°C. Viability of treated seed exceeded 70%.

A coarse granite-derived sand and a basalt-derived self-mulching clay were used as the planting media. Five depths of sowings were employed—2 in., 1 in., 0·5 in., 0·25 in. and on the surface.

On a site treated with endrin as a precaution against seed-harvesting ants, separate and adjacent beds of the two planting media were established. Twenty-five seeds of each cultivar were sown per plot. On each soil four replications were arranged as randomized blocks of 15 treatments each, i.e. 5 depths x 3 cultivars. The planting media were tamped and watered as filling of the beds proceeded. The 2 in. deep treatment plots were the first sown. Seed was spaced on a grid over a firm soil surface. The beds were then filled to 1 in. and that treatment sown; the succeeding sowings in ascending order were similarly effected. The surface-sown plots were surrounded by $\frac{1}{2}$ in. high galvanized iron collars to prevent the lateral displacement of seed when the beds were watered.

Soil moisture was maintained at field capacity to at least 3 in. depth by surface watering. Except on one occasion, the beds were protected from rainfall by the use of transparent plastic covers, which were removed at other times.

Seedling emergence was recorded every 2 days for 30 days after sowing. Although observations were maintained for 3 months, no emergence occurred after the first 30 days.

III. RESULTS

The emergence of the three cultivars and the number of days taken to reach 50% maximum emergence are recorded in Tables 1 and 2 for the basaltic and granitic soils respectively.

TABLE 1

EMERGENCE OF STYLOSANTHES ON A BASALTIC SOIL

Sowing Depth	Emergence in 30 Days								Days to 50% Maximum Emergence		
	Stylo (A0)		Townsville Lucerne (A1)		Fine Stem Stylo (A2)		General Mean		Stylo (A0)	Townsville Lucerne (A1)	Fine-stem Stylo (A2)
	Mean*	Equiv. Mean %	Mean*	Equiv. Mean %	Mean*	Equiv. Mean %	Trans. Mean*	Equiv. Mean %			
0·0″ (B0)	0·0993	1·0	0·0497	0·2	0·1842	3·4	0·1111	1·2	..	..	..
0·25″ (B1)	0·5968	31·6	0·5615	28·4	0·7124	42·7	0·6235	34·0	7·00	7·25	6·00
0·5″ (B2)	0·6210	33·9	0·4571	19·5	0·5898	31·0	0·5560	27·9	6·25	8·00	6·50
1·0″ (B3)	0·4286	17·3	0·1470	2·2	0·1194	1·4	0·2317	5·3	..	..	..
2·0″ (B4)	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	..	..	..
Mean	0·3491	11·7	0·2431	5·8	0·3212	10·0	..	..	..	..	..

	Species	Depth	Species x Depth	
L.S.D. 5% ..	0·0596	0·0769	0·1332	1·93
L.S.D. 1% ..	0·0796	0·1028	0·1781	2·66
	A0≫A1 A2>A1	B2, B1≫B3≫B0≫B4	A0B3≫A1B3, A2B3 A2B0>A1B0	A2B1<A1B2

* Inverse sine transformation.

TABLE 2

EMERGENCE OF STYLOSANTHES ON A GRANITIC SOIL

Sowing Depth	Emergence in 30 Days								Days to 50% Maximum Emergence		
	Stylo (A0)		Townsville Lucerne (A1)		Fine Stem Stylo (A2)		General Mean		Stylo (A0)	Townsville Lucerne (A1)	Fine-stem Stylo (A2)
	Mean*	Equiv. Mean %	Mean*	Equiv. Mean %	Mean*	Equiv. Mean %	Trans. Mean*	Equiv. Mean %			
0·0″ (B0)	0·0	0·0	0·1194	1·4	0·0849	0·7	0·0681	0·5	..	..	..
0·25″ (B1)	0·5835	30·4	0·6943	40·9	0·6623	37·8	0·6467	36·3	3·75	7·25	4·25
0·5″ (B2)	0·5769	29·8	0·3317	10·6	0·4302	17·4	0·4463	18·6	5·50	9·69	5·69
1·0″ (B3)	0·1194	1·4	0·0	0·0	0·0698	0·5	0·0631	0·4	..	..	..
2·0″ (B4)	0·0	0·0	0·0974	0·9	0·0497	0·2	0·0490	0·2	..	..	..
Mean	0·2560	6·4	0·2485	6·0	0·2594	6·6	..	..	..	..	..

	Species	Depth	Species x Depth	
L.S.D. 5% ..	0·0893	0·1152	0·1996	1·20
L.S.D. 1% ..	0·1193	0·1541	0·2668	1·68
	N.S.D.	B1≫B2≫B0, B3, B4	A0B1, A0B2≫A0B0, A0B3, A0B4 A1B1≫ A1B0, A1B2, A1B3, A1B4 A1B2≫A1B3 A1B2 > A1B0, A1B4 A2B1 > A2B2≫A2B0, A2B3, A2B4 A0B2 > A1B2	A0B1≪A0B2 A1B1≪A1B2 A0B1, A2B1≪A1B1 A0B2, A2B2 ≪A1B2 A2B1; A2B2 No. sig. diff. (Exact test)

* Inverse sine transformation.

On the basaltic soil, the emergence of each cultivar was similar at the 0·25 and 0·5 in. depths, which were significantly superior to all others. Scored on time taken for 50% maximum emergence, sowing depths of 0·25 and 0·5 in. gave similar results.

On the granitic soil, differences between percentage emergence of the three cultivars were not significant. Townsville lucerne and fine-stem stylo emergence from 0·25 in. was significantly superior to that from all other depths, but stylo showed no difference between the depths 0–25 in. and 0·5 in. In time taken to 50% maximum emergence, stylo and Townsville lucerne at 0·5 in. depth were significantly slower than at 0·25 in. Fine-stem stylo emerged equally well at the two depths.

IV. DISCUSSION

The differences in seedling emergence obtained from sowing stylo, Townsville lucerne and fine-stem stylo at various depths demonstrated that, where soil moisture was adequate, depth of seed placement was critical for the three members of the genus *Stylosanthes* examined.

While the optimum sowing depths were 0·25 in. and 0·5 in. for the three species, the reasons for emergence failure from greater depths were not examined in this experiment.

Surface sowing of stylo and Townsville lucerne seed has been recommended and has succeeded in practice. In the field two factors, not operating in the trial, contribute to establishment: seed is pressed into the soil by animals' hooves and is worked into cracks and depressions by storm rains. This can be achieved in uncultivated native pasture on light-textured soils if the stocking rate after sowing is increased. Cultivation of native pasture prior to seeding with these two species is usually aimed at reducing competition from vigorous native species and assisting rainfall penetration. As a consequence, a seedbed of loose soil is produced.

Under these conditions, continued stocking and normal rainfall on the treated area would provide surface-sown *Stylosanthes* seed with the minimum necessary depth of placement, as determined in this experiment. Mechanical coverage would result in placement of the seed at an excessive depth.

Where it is impractical to drill seed to a predetermined depth, it is preferable that seed be sown on the surface following cultivation and that further mechanical treatment be restricted to rolling.

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REFERENCES

Foster, W. H. (1961).—Note on the establishment of a legume in rangeland in Northern Nigeria. *Emp. J. Exp. Agric.* 29:319.

Graham, T. G. (1963).—Strip planting Townsville lucerne in speargrass. *Qd Agric. J.* 89:671.

Miles, J. F. (1949).—Plant introduction trials in Central Queensland 1936-46. *Divl Rep. Div. Pl. Ind. CSIRO* No. 6.

Norman, M. J. T. (1960).—Pasture establishment at Katherine, N.T. *Tech. Pap. Div. Ld Res. C.S.I.R.O. Aust.* No. 8.

Shaw, N. H. (1961).—Increased beef production from Townsville lucerne (*Stylosanthes sundaica* Taub.) in the spear grass pastures of central coastal Queensland. *Aust. J. Exp. Agric. Anim. Husb.* 1:73.

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