

Effect of plant population and phosphorus fertilizer application on dry matter and seed yield of two lablab (*Lablab purpureus*) varieties in Botswana

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Introduction Lablab has high potential as a protein source to grazing livestock especially during the dry season in arid Botswana. It produced 8.5t dry matter (DM)/ha and had 14% crude protein with 60% digestibility (APRU, 1988; Aganga, 2003). Lack of agronomic data on lablab production was probably the reason why some farmers in Botswana got yields as low as 300 kg/ha (APRU, 1987). Therefore, a trial of two lablab varieties was conducted to determine the effect of plant population and phosphorus (P) on DM yield.

Method Over two seasons from 2002-2004, a trial was conducted at Morale (23° 34'S and 26° 50'E; Haplic Acrisol), Maun (19° 56'S 25° 40'E; Gleyic Luvisol) and Pandamatenga (18° 32'S 23° 29'E; Utric Vertisol). A 2x3x3 factorial experiment, with treatments arranged in a randomised complete block design with 2 replicates each, tested 2 lablab varieties (Highworth and Rongai) x 3 plant populations (53333^{S1}, 26667^{S2} and 17778^{S3} plants/ha) x 3 P fertiliser rates (0, 40 and 80 kg P/ha). Fertiliser was placed in pre-marked planting stations and was mixed with soil before placing the seed. Two seeds of lablab were planted at 4cm deep. The seedlings were thinned to 1 plant/station at 14 days after emergence. DM yield was determined gravimetrically at 50% flowering stage after samples were dried at 80°C for 4 days. Using a Vernier calipers, stem diameter of 5 representative plants/plot was measured at a 20 mm height above ground. A SAS statistical package analysed the data after log transformation.

Results Rainfall at Panda, Maun and Morale was 512.4, 332.1 and 326.7mm, respectively, which gave yields (1.9-4.8 t DM/ha) that were within the range observed in semi-arid areas (Murthy & Colucci, 1999). High plant population (S1) tended to produce more DM and plants with significantly ($P \leq 0.05$) smaller stem size than S2 and S3 (Table 1). When plant population was reduced, plants produced more shoot branches (unpublished data) and developed bigger stems, thereby compensating for yield losses. Rongai produced bigger plants and ultimately more DM than Highworth (Table 1). Phosphorus fertilizer did not ($P \leq 0.05$) influence lablab DM yield but slightly increased stem size. Only Highworth set seed and produced 561 and 192 kg/ha at Maun and Morale, respectively.

Table 1 Effect of plant population and fertiliser P application on lablab performance in Botswana

Treatment	Yield (t DM/ha)				Stem size (mm Ø)			
	Maun	Morale	Panda	Mean	Maun	Morale	Panda	Mean
Population (Plants/ha)								
53333	1.49a	1.02a	1.72a	1.41a	2.55b	2.33b	2.36b	2.41b
26667	1.35a	0.93a	1.63ab	1.30b	2.68a	2.49a	2.51a	2.56a
17777	1.39a	0.86a	1.52b	1.25b	2.71a	2.54a	2.52a	2.59a
P (kg/ha)								
0	1.45a	0.97a	1.59a	1.34a	2.57b	2.46a	2.44a	2.49b
40	1.35a	0.95a	1.68a	1.33a	2.63ba	2.44a	2.46a	2.51ab
80	1.43a	0.89a	1.61a	1.31a	2.73a	2.47a	2.48a	2.55a
Variety								
Rongai	1.53a	0.97a	1.64a	1.38a	2.69a	2.53a	2.53a	2.58a
Highworth	1.28b	0.90a	1.61a	1.27b	2.59a	2.38b	2.40b	2.46b

Conclusion Plant populations of 26667-53333 plants/ha maximized lablab DM yield. A Higher plant population (S1) produced plants of smaller stem thickness. Rongai tended to be more productive than Highworth, however only the latter that set seed under these environment.

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