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Seasonal Influence on Productivity and Quality of Dolichos Bean (*Dolichos lablab* (Roxb.) (L) Var. *typicus*) Genotypes

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An experiment was laid at Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during 2009-2010 to study the influence of seasons on growth, flowering, yield attributes and yield of Dolichos bean genotypes. The results revealed that the season, July-August sowing recorded more number of secondary branches, more number of pods, pod weight, pod length and yield. With respect to genotypes tried, the genotype Dbp-3 recorded more number of secondary branches, highest number of pods, pod weight, pod length and yield. The treatmental factor combinations performed with more number of secondary branches, highest number of pods, pod weight, pod length and yield was recorded in genotype Dbp-3 sown during July-August season. September-October season crop took about 84.3 days for first fruit harvest compared to earlier sown (i.e.) July-August season crop with 93.7 days. Days taken to first fruit harvest were earlier in CO-1 as compared to Dbp-3 and Dbp-4.

Key words: Dolichos bean, season, number of pods, crude protein, yield

Lablab bean or Dolichos bean is one of the important legume vegetable crops of India. It is grown in an area of 1377 ha with annual production of 17896 tonnes and average productivity of 13.0 t/ ha in Tamil Nadu (Chandra Mohan, 2008). The flower colour, size, shape and type of pods of this crop differs from strain to strain. It is a good source of protein, minerals, vitamins (Basu *et al*. 2002) and antihypertensive (Bradley, 1999). The growth characters and yield potential of a crop depend on the environmental conditions prevailing during its growth. The positive effect of environmental factors on growth and yield could be harnessed if the information on optimum time of sowing is made available. Optimum sowing date plays a decisive role in growth and production of French bean as the crop experiences cooler phase (end of December to January) during later stage of crop growth (Singh *et al.,* 1992). However, owing to lack of information on specific agro-climatic requirements for potential yield, the realised yield is far below than its potential. Therefore, proper time of sowing is critical to increase the productivity. Hence, an attempt was made to find out a suitable variety and optimum sowing time or season under climatic region of Coimbatore.

Materials and Methods

A field experiment was conducted at Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during 2009-2010 to study the influence of seasons on growth and yield of Dolichos bean genotypes. The experiment was laid out in a factorial randomized block design with four replications in three seasons of sowing *viz*., July-August, September-October, December-January were tried as treatments under factor (A) and three genotypes *viz*., CO- 1, Dbp-3, Dbp-4 as treatments under factor (B). The soil of the experimental site was sandy loam. The soil was having medium available nitrogen (220.5 kg ha^{-1}), medium available phosphorus (19.2 kg ha^{-1}) and medium potassium (280.6 kg ha^{-1}).

Three seeds of each Dolichos bean genotype CO-1, Dbp- 3 and Dbp- 4 were sown per pit at a spacing of 2 m × 1.5 m. Irrigation was given immediately after sowing and on 3rd day, thereafter once in a week through drip irrigation. FYM was applied at the rate of 20 t / ha and 100 g of NPK 6:12:12 mixture as basal and 10 g of N per pit was applied at 30 days after sowing. 2kg each of *Azospirillum* and *Phosphobacteria* per ha was applied at the time of sowing. Since the plants are indeterminate they were trailed over pandal and the side branches were removed up to the height below the pandal in all the three genotypes. Pinching was done to promote flowering. Observations on number of secondary branches (30, 60 and 90 DAS), days to first and 50 % flowering, yield attributes *viz*., days to first harvest, number of harvest, number of pods per plant, individual pod weight, pod length, pod width and green pod yield were recorded. Quality

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parameters like crude protein and crude fibre were also recorded.

Results and Discussion

Number of secondary branches

Both season and genotype had significant influence on number of secondary branches. July-August season crop recorded higher number of secondary branches (2.07, 4.33 and 6.85) at all the phenological stages viz., 30, 60 and 90 DAS respectively than the other two seasons (Table 1.). This might be due to optimum temperature and more sunshine hours prevailed during the vegetative phase of growth being Dolichos bean as photosensitive. Similar results were reported by Venkatesvaralu and Soundara Rajan (1991) and Sharma *et al*. (2008) that significantly superior performance of growth parameters in different growth stages in early sowing was mainly due to longer growth period.

The findings from this work are also in line with the report of Yusufali *et al.* (2007) in field bean. Reduction in growth with delay in sowing may be attributed to reduced crop duration. This is in accordance with the earlier findings of Parvender Sheoran *et al.* (2008) in mungbean. Season also had influenced the number of secondary branches in mungbean (Guriqbal Singh and Sekhon, 2007).

Days to first flowering and 50 % flowering

Both season and genotype had highly significant effect on days taken to first flowering and 50 % flowering. July-August season crop took about 61.88 days for flower opening and 66.7 days for 50% flowering as compared to later sown (i.e.) September-October season crop which took 50.52 days for flower opening and 57.27 days for 50 % flowering (Table 2).

Table 1. Seasonal influence on number of secondary branches in Dolichos bean genotypes

Season	30 DAS				60 DAS				90 DAS			
	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
S_1	1.10	2.70	2.40	2.07	1.50	6.05	5.45	4.33	3.10	9.55	7.90	6.85
S_2	0.85	1.75	1.60	1.40	1.25	3.35	3.15	2.58	2.85	5.50	4.35	4.23
S_3	0.63	1.38	1.38	1.13	0.75	2.38	2.38	1.83	1.63	5.38	4.25	3.75
Mean	0.86	1.94	1.79	1.53	1.17	3.93	3.66	2.92	2.53	6.81	5.50	4.94
	S	G	SG		S	G	SG		S	G	SG	
SEd	0.088	0.153	0.153		0.091	0.091	0.158		0.117	0.117	0.203	
CD (0.05)	0.182	0.316	0.316		0.188	0.188	0.325		0.242	0.242	0.418	

S_1 Season -1 (July-August, 2009) G_1 CO-1
S_2 Season -2 (September-October, 2009) G_2 Dbp-3
S_3 Season -3 (December-January, 2010) G_3 Dbp-4

Days taken to first flowering and 50 % flowering were earlier in CO-1(46.55 and 52.63 respectively) compared to Dbp-3 and Dbp-4. This might be due to the short duration of CO-1 than the longer duration of Dbp-3 and Dbp-4. But, seeds sown in December failed to flower, due to unfavourable environmental conditions as reported previously in French bean (Begum *et al*., 2003).

Yield attributes and yield

The yield components such as number of green pods per plant, individual green pod weight, pod length and pod width were favourably influenced by seasons (Table 3 & 4) . Seasons and genotypes had marked influence on the yield attributes of Dolichos bean. July-August season crop recorded more number of green pods per plant (606.5), pod weight (9.77 g) and pod length (13.96 cm). July-August season crop increased the yield attributes by better and early stand establishment and its ability to exploit favourable environmental conditions.

Table 2. Seasonal influence on days to first and 50 % flowering in Dolichos bean genotypes

Season	Days to first flowering				Days to 50 % flowering			
	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
S_1	48.95	67.40	69.30	61.88	54.25	71.95	73.90	66.70
S_2	44.15	52.65	54.75	50.52	51.00	58.85	61.95	57.27
S_3 *	-	-	-	-	-	-	-	-
Mean	46.55	60.03	62.03	56.2	52.63	65.40	67.93	61.98
	S	G	SG		S	G	SG	
SEd	0.105	0.129	0.183		0.178	0.218	0.308	
CD (0.05)	0.225	0.275	0.389		0.379	0.464	0.657	

*Observations were not taken in S_3 as the crop remained vegetative as on June, 2010.

With delayed sowing, soil moisture availability, duration of different phenophases and total crop duration were reduced and the crop was subjected to low temperature conditions during seedling establishment and vegetative growth stages resulting in poor development of resource pool and its further translocation to sink. This is in accordance with the earlier findings of Parvender sheoran *et al*. (2008) in chick pea. But seeds sown in December

Table 3. Seasonal influence on yield components in Dolichos bean genotypes

Season	No. of green pods per plant				Individual pod weight (g)			
	G1	G2	G3	Mean	G1	G2	G3	Mean
S1	469	732.4	618.05	606.5	8.28	11.05	9.99	9.77
S2	192.7	391.3	308.4	297.5	7.46	9.90	8.90	8.75
S3 *	-	-	-	-	-	-	-	-
Mean	330.8	561.8	463.2	452	7.87	10.47	9.44	9.26
	S	G	SG		S	G	SG	
SEd	4.907	6.010	8.499		0.076	0.093	0.132	
CD (0.05)	10.459	12.809	18.115		0.162	0.199	NS	

*Observations were not taken in S_3 as the crop remained vegetative as on June, 2010.

failed to produce any pod which might be due to unfavourable environmental conditions as reported previously in French bean (Begum *et al*., 2003).

Number of green pods per plant

Pod number is a major yield determining factor in Fabaceae family crops. Seasons had significant influence on the number of pods per plant which is an important yield component. Higher number of pods per plant was recorded with the July-August season crop (606.5) and delayed sowing recorded reduction in yield as reported in guar (Lakshmi Kalyani and Maheswara Reddy, 2007).

Sowing of Dolichos bean during August resulted in more number of pods per plant with effective translocation and distribution of photosynthates to sink, which in turn resulted in elevated stature of yield attributes which was due to favourable weather conditions such as rainfall distribution and temperature during the crop growth period. Relatively higher levels of parameters of guar sown at first fortnight of July of sowing has been reported earlier by Lakshmi Kalyani and Reddy (2007).

Genotypes also had significant influence on the number of pods per plant. Dbp-3 recorded more

Table 4. Seasonal influence on yield components in Dolichos bean genotypes

Season	Pod length (cm)				Pod width (cm)			
	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
S_1	11.76	18.05	12.08	13.96	2.39	2.52	3.39	2.76
S_2	9.19	14.12	9.66	10.98	2.28	2.31	3.38	2.66
S_3 *	-	-	-	-	-	-	-	-
Mean	10.48	16.08	10.87	12.47	2.33	2.42	3.38	2.71
	S	G	SG		S	G	SG	
SEd	0.047	0.058	0.082		0.018	0.022	0.031	
CD (0.05)	0.101	0.124	0.175		0.038	0.047	0.066	

*Observations were not taken in S_3 as the crop remained vegetative as on June, 2010.

number of green pods per plant (561.8) followed by Dbp-4. It might be due to favourable environment which provided more number of pickings during prolonged crop duration and genotype variation. The findings from the present work are also in line with the report of Lalit Kumar *et al*. (2009). Significant differences in pod numbers among genotypes were probably due to differences in their genetic makeup and the environmental conditions under which the Dolichos bean were grown. Similar results were reported by Naeem *et al*. (2009).

Individual pod weight

Pod weight is an important factor governing the yield. The pod weight was significantly influenced by the seasons and genotypes. July-August sown crop was highly influenced the pod weight with a value of 9.77g which can be attributed to the increased production of green pod yield which was in confirmity with the work of Jena (2003) and Begum (2003) in French bean. The increase in pod weight of French bean is higher in early sowing crop as reported by Moniruzzaman *et al*. (2007) lend support to the present findings.

Green pod length

July-August season crop recorded the highest pod length (13.96 cm) followed by September-October season. Similar results were also reported by Begum *et al*. (2003) in French bean and Lalit kumar *et al*. (2009) in garden pea. Genotype also has significant influence on green pod length. Significant and maximum pod length was recorded in Dbp-3 (16.08 cm) and minimum in CO-1, showing varietal variation. Similar results were also reported by Shukla and Kohli (1992) in peas.

Green pod width

Pod width has significantly influenced by season and genotypes. Broader pods were produced in July-August season crop (2.76 cm) followed by September-October season crop. Early sowing recorded maximum breadth of pods than the late sowing as reported previously (Moniruzzaman *et al*., 2007). But Gill and Ahmad (1981) reported that in pea crop, pod breadth is not affected by different dates of sowing in Pakistan. Dbp-4 recorded broader pods with a value of 3.38 cm than the other

genotypes and showed varietal difference. This is in accordance with the earlier findings of Shukla and Kohli (1992) in peas.

Days to first harvest

Both season and genotype had highly significant effect on days taken to first harvest. July-August season crop took about 93.7 days for first harvesting as compared to September-October crop which took about 84.3 days for first pod harvest.

This implies that the late sown crop which was early by about 9.4 days for first pod harvesting as compared to early sown July-August season crop. Similar results were recorded in mungbean (Hargopal Singh and Krishan Kumar Vashist, 2004). Earliest pod picking under 30 October sowing may probably be because of earliest germination, flowering and 50 % flowering in French bean (Singh *et al*., 1992). Days taken to first pod picking were earlier in CO-1 compared to Dbp-3 and Dbp-4. This might be due to short duration of CO-1 than the longer duration of Dbp-3 and Dbp-4.

Number of harvest

Both season and genotype highly influenced the number of pod pickings. July-August season crop had more number of pickings (13.3) followed by September –October season crop. In early sown crop, higher pod yield resulted from early start and more number of pickings in the favourable climate. Similar results were reported in cowpea (Randhir Singh *et al*., 1994). Among the genotypes, number of pod pickings was higher in Dbp-3 (12.4) followed by Dbp-4 and lower in CO-1. This might be due to differences in duration of these genotypes.

Green pod yield

The green pod yields of Dolichos bean were significantly different among the seasons. The highest green pod yield of 18.89 t ha^{-1} was recorded with July-August season crop followed by September-October season crop (Table 5) . The highest green pod yield was recorded with early sowing and there was significant reduction in yield in successive dates of sowing. The yield potential of Dolichos bean is mainly due to number of secondary branches per plant, number of green pods per plant and green pod weight in July-August season crop. The findings from the present work are also in line with the report of Parvender sheoran *et al*. (2007) in mungbean.

Highest green pod yield was recorded in Dbp-3 (17.78 t/ha) followed by Dbp-4 and it might be due to increased number of pickings owing to prolonged crop duration compared to CO -1 and genotype. Similar results were reported by Shukla and Kohli (1992) in peas. Green pod yield is a cumulative performance of pod numbers, pod length, pod width and pod weight. Enhancement in yield attributes would ultimately culminate into pod yield production of each genotype. Similar studies regarding genotype variation for different attributes in other plants were reported by Idrees *et al.* (2007), Morris (2008) and Naeem *et al*. (2009).

Quality Traits

Crude protein content of pods

It is an important quality character in leguminaceous crops. The present investigation revealed that both season and genotype had significant on protein content of pods. July-August season crop recorded higher pod protein content (5.56 %) than September -October season crop (Fig 1.). Sharma *et al*. (1984) revealed that the cluster bean sown on 5 July recorded significantly higher protein percentage than the crop sown on 20 June, 20 July and 5 August.

Sharma *et al*. (1989) also reported that the highest protein content was recorded with early date of sowing (13 July) and there was significant reduction in protein content in successive dates. The protein content was maximum in the crop sown on 10 June at Kalpa and 25 August at Solan in pea (Shukla and Kohli, 1992). Among the genotypes, Dbp-3 recorded higher protein content (5.56 %) than the other two genotypes.

Table 5. Seasonal influence on yield in Dolichos bean genotypes

Season	Days to first harvest				Number of harvest				Green pod yield (t/ha)			
	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean	G_1	G_2	G_3	Mean
S_1	81.3	99	100.9	93.7	9.8	15.5	14.5	13.3	12.69	23.43	20.55	18.89
S_2	78	85.9	89	84.3	6.6	9.2	8.6	8.1	4.75	12.13	8.39	8.42
S_3 *	-	-	-	-	-	-	-	-	-	-	-	-
Mean	79.6	92.4	94.9	89	8.2	12.4	11.6	10.7	8.72	17.78	14.47	13.65
	S	G	SG		S	G	SG		S	G	SG	
SEd	0.178	0.218	0.308		0.106	0.130	0.184		0.169	0.207	0.293	
CD (0.05)	0.380	0.464	0.657		0.226	0.277	0.391		0.361	0.442	0.624	

* Observations were not taken in S_3 as the crop remained vegetative as on June, 2010.

Crude fibre content of pods

The crude fibre content was also found influenced by season and genotypes. Considering the season, July-August sown crop recorded lower crude fibre content (1.68 %) than the September-October sown crop.

Dbp -3 recorded lower crude fibre content (1.74%) followed by Dbp-4 and CO-1. This might be due to variation in genetic makeup and environment. The protein content of green pods was much improved with reduction in crude fibre in all the three

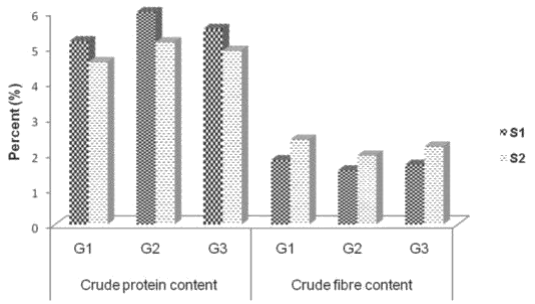

Fig 1. Seasonal influence on crude protein and fibre (%) in Dolichos bean genotypes

genotypes sown during both the seasons, July-August and September- October. This is in accordance with the earlier findings of Sadasivam (1995) in Dolichos bean.

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