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Influence of Time of Sowing on Productivity and Seed Quality in Babchi (*Psoralea corylifolia* L.)

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Abstract- An experiment was conducted to evaluate the effect of different sowing time on seed yield and quality in under used medicinal plant babchi. The study was carried out for 12 months from January to December. Results showed that the seeds sown in November month recorded the maximum seed yield and quality parameters followed by October month than other months. November month recorded the maximum field emergence (92%), number of branches per plant (12), number of racemes per plant (121) at 90 days after sowing, pod yield (2415kgha^{-1}), seed yield (1931kgha^{-1}), 100 seed weight (1.69g), germination (46%), vigour index (901), protein (18.8%), oil content (6.7%) and it was on pared with October month. Lowest seed yield of 825 kgha^{-1} was recorded in February month sown crop, the other biochemical quality parameters like protein (18.0%) and oil (6.2%) content were also low in this month. Finally, it could be concluded that October or November was the suitable time for babchi sowing.

Index Terms- Babchi, medicinal plant, month of sowing, yield and quality parameters.

I. INTRODUCTION

Psoralea corylifolia L. commonly called as babchi or karpokkarasi is an important medicinal plant in the Indian ayurveda, Tamil siddha and Chinese medicine belonging to the family Fabaceae. It is an erect, annual herb. It bears a single seeded pod, which is indehiscent and the pericarp is usually found adhering to the seed. The pericarp is sticky and oily which contains coumarins, of which Psoralen and Isopsoralen are therapeutically important. It has been used in treating leprosy and psoriasis, eczema and hair loss. In addition, *Psoralea* is used to promote bone calcification, healing of wounds and ulcers. Besides treating psoriasis, psoralen is being investigated as a cure for several diseases including AIDS. It is also used in the treatment of intestinal amoebiasis (Farooqi and Sreeramu, 2001).

Medicinal plants are much desired for various purposes of pharmaceutical application and rural health setup due to their very broad ecological adaptations. But no attempt has so far been made for the extensive cultivation of many species except a very few, that are being exported. Psoralea is not cultivated on a commercial scale anywhere but reported to be grown to some extent in Rajasthan and the eastern districts of Punjab adjoining Uttar Pradesh in India for its seeds (Saif *et al*., 2007). Hence, it is warranted to trace crop management techniques for large scale production such as suitable time of sowing so as to get higher yield in an ecofriendly manner. Unlike the commercial crop, the seed crop require special conditions which are under the influence of the environment prevailing during seed formation and maturation phases for realizing good quality seeds. Seed production is very much influenced by the environmental conditions particularly photoperiod and temperature and such information enable the production of good quality seeds (Kalavathi, 1996). As an upshot of the impact of environmental parameters on physiological stages, the optimum sowing time of a crop varies with region and genetic differences of cultivars (Seghat and Mousavi, 2008). As emphasized by Snoek (1981), the total yield of the crop is markedly influenced by different sowing and transplanting times. In seed production, Wood *et al.* (1980) opined that the environmental conditions particularly the light and temperature (Crocker and Barton, 1955) interact with genetic system and elicit developmental changes during ripening, which exert influence on yield and seed quality. Choice of appropriate sowing time is important, because of the necessity of maximal usage of natural resources during growing season. In pumpkin early sown plants were weakly established in spring due to the low soil temperature and the damages of frost. Also, the delay in sowing adversely influences the growth and development of the plants because of shortened growth period and the likelihood of the coincidence of flowering with high temperature (Robert and Korkmaz, 1998). Hence studies were carried out to fix the optimum time of sowing to produce the high quality seeds.

II. MATERIALS AND METHODS

Seed crop of babchi were raised in Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore from January 2009 to December 2009 at monthly interval, on 16th day of every month seeds were sown under irrigated condition. The soil type was clay loam and the experimental plot size was 3x3 m and the spacing adopted was 45x45 cm. The crop was fertilized with the recommended Nitrogen, Phosphorus and Potassium (NPK) schedule of 50:60:50 kgha^{-1} (Farooqi and Sreeramu, 2001) that were applied basally prior to sowing of seeds except 50 kgha^{-1} N which was applied as top dressing on 45th day after sowing. The experiment was laid out in Randomized block design. At each month, the trial was conducted in four replicates of similar plot size. Need based plant protection measures were also taken to control the incidence of pests and diseases during the crop period. The crop was harvested at physiological maturity stage in three different pickings. During the crop period, at each month sowing the

following observations *viz.,* field emergence (%), plant height (cm), number of branches per plant, number of racemes per plant at 60 and 90 days after sowing, days to first flowering, days to 50% flowering, pod yield ($kgha^{-1}$), seed yield ($kgha^{-1}$) and 100 seed weight (g) were recorded. Extracted seeds were dried to 8% moisture content and were evaluated for the seed quality parameters *viz.,* germination (%) as per ISTA (2010), hard seed (%), root length (cm), shoot length (cm), dry matter production 10 $seedlings^{-1}$(mg) and vigour index (Abdulbaki and Anderson, 1973). The seeds were also evaluated for the biochemical parameters *viz.,* Electrical conductivity (dSm^{-1}) (Presley, 1958), Dehydrogenase activity (OD value) (Kittock and Law, 1968), Protein content (%) (Ali-Khan and Youngs, 1973) and Oil content (%) (AOAC, 1960). The data obtained from different observations were analyzed as per methods described by Panse and Sukhatme (1985). Wherever necessary, the % values were transformed to angular (Arc-sine) values before analysis. The critical differences (CD) were calculated at 5% probability level.

III. RESULTS AND DISCUSSION

The effect of time of sowing on seed yield and quality revealed that highly significant variations was observed in all the growth, yield and seed quality parameters except root, shoot length and dehydrogenase activity (Table 1&2). Among the months of sowing, November month recorded highest field emergence of 92%. It is 18% higher compared to February month (74%). Summer months recorded the minimum field emergence it might be due to higher temperature that could have caused the mortality of weaker seedlings due to heat shock. The seeds sown at July month recorded maximum plant height of 29.6, 60.7, 94.7 cm at 30, 60, 90 days after sowing respectively. It is 57% higher than February month at 90 DAS. Sharratt and Gesch (2004) in *Ocimum* also revealed that the higher temperature during vegetative growth period reduced the plant height. In babchi the vegetative growth of February month sown crop coincide with summer months this might be reason for the minimum plant height. The number of branches were also the highest (12) in October and November month sown crop, than February (9) at 90 days after sowing. The critical yield attributing parameters like number of racemes per plant were maximum (121) with November month, which recorded 37% higher number than February month (Figure 1). In all growth and yield parameters the October month observations were on pared with November month, which might be because of favourable weather conditions prevailed during that months allows better utilization of nutrients and other resources resulting in higher numbers of reproductive structures. Rahimi (1993) in cumin also expressed that the yield components are highly sensitive to photoperiod and temperature.

The crop sown in the April month expressed the first flowering, it was 13 days earlier than September (55 days). Days to 50% flowering was also low in April (51 days) and highest in September (66 days), might be due to the preference of long day condition by the crop. This variation was due to requirement of photoperiod for flowering of crops (Damato *et al*., 1994 and Mohan *et al*., 2001). The pod ($2415kgha^{-1}$) and seed yield (1931 $kgha^{-1}$) per hectare were the highest in November month at a rate of 58 and 57% higher than February month, pod and seed respectively. These variations might be due to the environmental factors such as light, temperature and rainfall which play an important role in growth and yield of the crop. As the light and temperature remained favourable for growth ultimately more photosynthetic surface was available for improvement in yield. In addition the February sown crop came to flowering during the month of April and seed development and maturation took place during May month, where high temperature and low relative humidity is the phenomenal prevalence. These extreme conditions of this month affect the development of seeds as evident through the low yield of the present result. This leads to the conditions favourable for early flowering (high temperature and long day) which is not ideal to produce higher yield of good quality seeds. On the other hand, higher pod and seed yield with better quality were obtained from November sowing followed by October, where the crop came to maturity in the months of February, January respectively, when the weather conditions are conducive, devoid of extreme temperature and low humidity, which might have been favourable for higher productivity.

Results also showed that among the months, November recorded the maximum (1.69g) 100 seed weight than February month (1.30g), due to the optimum temperature during seed development enables the accumulation of higher photosynthates as opined by Chaudhari *et al.* (1995) and Reddy and Rolsten (1999) in coriander. The physiological potential of the seed in terms of germinability (46%), dry matter production (100 mg 10$seedlings^{-1}$) and vigour index (901) (Figure 2) were higher with the seeds produced from November sown crop, which recorded the 11% higher germination, dry matter production and 16% higher vigour index than February month. Castillo *et al.* (1994) and Greven *et al.* (1997) stated that the environment during seed development is the major determinant of seed quality, particularly seed vigour. The results of the present study revealed that the maximum average hard seed percentage (61%) was recorded in the seed lots harvested from January to March sown crop than September- November (54%) sown crop, because of high temperature and low relative humidity that coincided with seed development. The development of hard seed in leguminous species is both genetic and environmentally controlled (Baskin and Baskin, 2000) and the months of sowing, exerted influence on this seed quality aspect. The difference in hard seed percentage across the months were highly significant and the seeds sown during February reached seed maturity during April- May coinciding with hot and dry weather resulting in higher desiccation, that associate with higher percentage of hard seeds which was also opined by Justice and Bass (1978). Similar that of growth and yield parameters the biochemical factors like protein (18.8%) and oil content (6.7%) also superior in November month than other months. The February month recorded lower level of protein (18.0%) and oil content (6.2%). The lowest electrical conductivity (0.094 dSm^{-1}) was recorded in November month and highest (0.101 dSm^{-1}) was in April month, due to variations in environmental factors cause the higher level of membrane damage in summer months.

Thus, the study concluded that November month sowing recorded the maximum seed yield and quality characters and it was on pared with October month. The environmental condition prevailed during this month enhanced the growth and yield parameters. Hence for babchi, October or November month are

the suitable months for seed production with maximum seed quality.

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Table 1: Influence of time of sowing on growth and yield attributing characters

Month of sowing	Field emergence (%)	Plant height (cm)			Number of branches per plant	Number of racemes per plant	Days to first flowering	Days to 50 % flowering	Pod yield ($kgha^{-1}$)	Seed yield ($kgha^{-1}$)
		30 DAS	60 DAS	90 DAS	60 DAS	60 DAS				
January	82 (64.90)	10.3	33.0	51.3	7	11	50	55	1486	1190
February	74 (59.34)	7.3	19.4	41.1	5	7	46	52	1027	825
March	78 (62.03)	7.7	20.3	50.6	6	9	45	52	1161	859
April	75 (60.00)	8.1	33.0	53.3	6	9	42	51	1279	1022
May	75 (60.00)	13.6	33.6	63.9	7	8	45	51	1684	1348
June	88 (69.73)	13.7	34.4	78.1	7	10	46	54	1733	1388
July	90 (71.57)	29.6	60.7	94.7	7	11	46	55	1956	1565
August	90 (71.57)	22.7	56.3	90.4	7	17	49	56	1886	1511
September	90 (71.57)	14.3	48.5	74.7	8	19	55	66	1921	1536
October	92 (73.57)	22.4	50.1	81.5	8	20	52	62	2064	1654
November	92 (73.57)	20.7	52.4	89.0	8	21	50	60	2415	1931
December	85 (67.21)	12.2	36.7	65.0	7	15	50	60	1561	1249
SEd	(0.831)	0.236	0.442	0.593	0.031	0.164	0.118	0.158	13.120	10.761
CD (P=0.05)	(1.724)	0.490	0.918	1.229	0.064	0.340	0.244	0.327	27.209	22.317

DAS- Days after Sowing

Table 2. Influence of time of sowing on resultant seed and seedling quality characters

Month of sowing	100 seed weight (g)	Hard seed (%)	Root length (cm)	Shoot length (cm)	Drymatter production 10 $seedlings^{-1}$ (mg)	EC (dSm^{-1})	Dehydrogenase activity (OD value)	Protein content (%)	Oil content (%)
January	1.42	60 (50.77)	10.9	8.4	95	0.095	1.160	18.5	6.6
February	1.30	62 (51.94)	10.7	8.2	93	0.100	1.155	18.0	6.2
March	1.35	62 (51.94)	10.7	8.2	89	0.099	1.157	18.2	6.4
April	1.41	60 (50.77)	11.0	8.4	89	0.101	1.156	18.2	6.3
May	1.44	58 (49.61)	10.9	8.3	92	0.098	1.156	18.5	6.5
June	1.49	58 (49.61)	11.1	8.5	90	0.097	1.159	18.7	6.5
July	1.68	56 (48.45)	11.1	8.4	93	0.096	1.160	18.7	6.5
August	1.63	56 (48.45)	10.8	8.3	98	0.095	1.162	18.6	6.6
September	1.60	54 (47.29)	10.9	8.4	99	0.095	1.161	18.7	6.6
October	1.69	54 (47.29)	11.0	8.4	95	0.095	1.162	18.7	6.6
November	1.69	54 (47.29)	11.2	8.4	100	0.094	1.162	18.8	6.7
December	1.43	56 (48.45)	11.0	8.3	91	0.097	1.160	18.6	6.6
SEd	0.006	(0.949)	0.163	0.163	2.301	0.002	0.019	0.163	0.106
CD (P=0.05)	0.012	(1.958)	NS	NS	4.750	0.003	NS	0.337	0.218

(Figures in parentheses indicate arc sine transformed values)

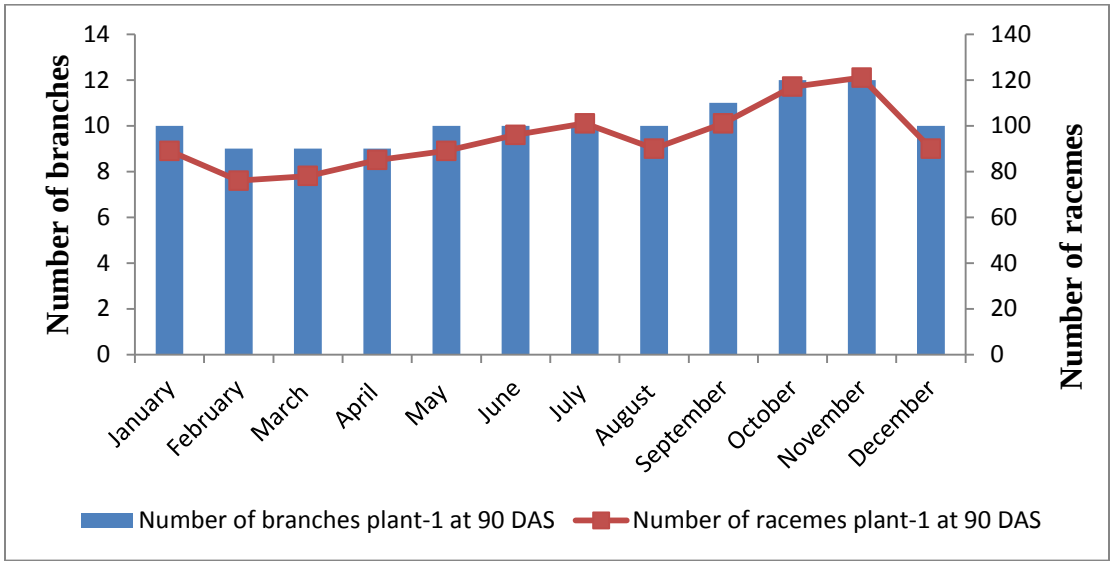

Figure1: Influence of time of sowing on yield attributing characters in babchi

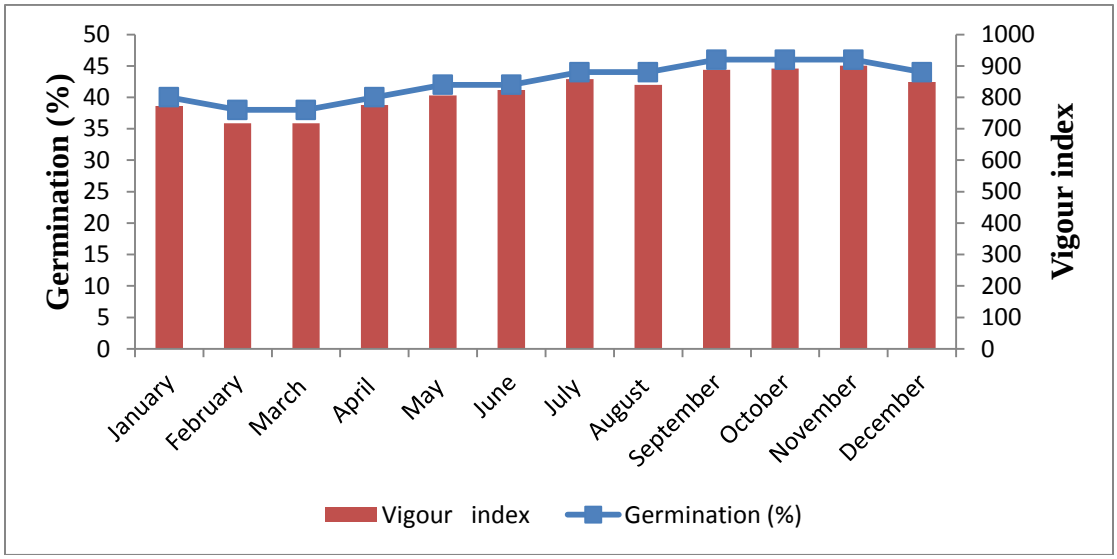

Figure 2: Influence of time of sowing on seed quality characters in babchi