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Effect of sowing time, seed rate and harvesting duration on germination of ashwagandha (*Withania somnifera*)

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Abstract

The experiment was carried out at Herbal garden, Rajendranagar, Hyderabad during the 2009-10. The experiment was laid out in Completely Randomized Block Design with factorial concept comprising a total of 18 treatments replicated thrice with two sowing dates (August 15th and August 30th), three seed rates (10 kg/ha, 12 kg/ha and 14 kg/ha) and three harvesting durations (150 DAS, 180 DAS and 210 DAS). Early germination (9.22 days) and maximum germination percentage (43.27%) was recorded with August 15th sown crop when compared to August 30th sown crop.

Keywords: *Withania somnifera*, ashwagandha, Rajendranagar

Introduction

Ashwagandha is an important cash crop for greening the arid and dry zone having medicinal properties belonging to solanaceae. Ashwagandha is late sown *kharif* crop and harvested between 150-170days after sowing. It is mainly cultivated in the drier parts of Madhya Pradesh, Punjab, Rajasthan and South India. In Madhya Pradesh, it is cultivated in about 4000 hectares area (Nigam *et al.*, 1984) [3]. Ashwagandha is an important drug used in ayurvedic medicines. The pharmacological activity of the roots is attributed to the presence of alkaloids withanine and somniferine. The roots also contain starch, reducing sugars and glycosides. The plant is a rich source of crude protein, calcium and phosphorous (Nigam *et al.*, 1984) [3]. The leaf paste and decoction are used both externally and internally for many ailments like sore eyes, boils, hand and foot swellings, wounds etc. An infusion of bark is used for control of asthma. The fruits and seeds are used in chest complaints. Ashwagandha is commercially grown for its roots. Now-a-days, use of ayurvedic medicines is increasing due to fewer side effects. The drug is mainly used in ayurvedic and unani preparations. The alkaloid withaferine-A which is present in roots having antibiotic and anti-tumour properties (Faroqui *et al.*, 2001) [2]. Plant extract of ashwagandha on stored pulses and products showed 100 per cent mortality of callosobruchus pest (Anuradha *et al.*, 2002) [1]. The germination of seed is very important to obtain plant density in a crop. Viability of seed varies with crop and ashwagandha seed undergo the dormancy after extraction of seed. In ashwagandha germination obtained is meager as it undergoes dormancy (Triveni and Anupama, 2010) [5]. Hence, germination study was undertaken while carrying out an experiment on "Effect of sowing time, seed rate and harvesting duration on growth of Ashwagandha" with an objective to see the effect of sowing time and seedrate on germination.

Materials and methods

The experiment was carried out during August 2009-March 2010 in Herbal garden, Rajendranagar, Hyderabad. The experiment was laid out with two sowing dates (August 15th and August 30th), three seed rates (10 kg/ha, 12 kg/ha and 14 kg/ha) and three harvesting durations (150 DAS, 180 DAS and 210 DAS) in Completely Randomized Block Design with factorial concept comprising a total of 18 treatments replicated thrice. The land was brought to fine tilth by ploughing and harrowing. The experimental area was divided into plots of 2m x 3m size. Irrigation channels of 0.5m size were provided. The cleaned seeds mixed with sand at the ratio of 1:1 and sown directly in the field by broadcasting method. The data recorded on germination were subjected to statistical analysis. The data were analyzed using computer software programmed by the method of variance outlined by Panse and Sukhatme (1985) [4].

Results and discussion

Effect of sowing time on germination

Time taken for germination (days)

Data pertaining to number of days taken for germination in Ashwagandha as influenced by sowing time are furnished in Table 1. Number of days taken for germination did not differ significantly due to sowing date. Minimum number of days taken for germination was recorded in D1 (August 15th sowing) (9.22) compared to D2 (August 30th sowing) (9.70).

Germination percentage (%)

Data pertaining to germination percentage in Ashwagandha as influenced by sowing time are furnished in Table 2. There was significant difference in germination percentage due to sowing date. High germination percentage was recorded in D1 (August 15th sowing) (43.27). Less germination percentage was recorded in D2 (August 30th sowing) (42.60). The crop germinated better when it was sown on August 15th. Superior germination in terms of time taken for germination and germination percentage were maximum in August 15th sown crop when compared to sowing on August 30th. It was resulted in early germination (9.22 days) and maximum per cent germination (43.27) with August 15th sowing. Trivedi and Anupama (2010) [5] have reported that freshly harvested seeds of Ashwagandha showed dormancy. The germination reported in scarified seeds was 40% whereas one year stored seeds germinated up to 4%.

Effect of seed rate on germination

Time taken for germination (days)

Data pertaining to number of days taken for germination in Ashwagandha as influenced by seed rate are furnished in Table 1. Different seed rates have not shown significant difference in number of days taken for germination. However, the minimum number of days taken for germination (9.28) was recorded with S2 (12 kg/ha) compared to S1 (10 kg/ha) and S3 (14 kg/ha) (9.56 each).

Germination percentage (%)

Data pertaining to germination percentage in Ashwagandha as influenced by seed rate are furnished in Table 2. Different seed rates have not shown significant difference in germination percentage. Higher germination percentage (43.17) was recorded with S1 (10 kg/ha). Lower germination percentage (41.97) was recorded with S3 (14 kg/ha) which was similar with S1 (10 kg/ha) (41.97).

Seed rate is an important factor which determines the absorption of nutrients in plants by creating competition between the plants for nutrients and admission of light for synthesizing food material through photosynthesis. Seed rate of S2 (12 kg/ha) resulted in minimum time taken for germination (9.28 days) when compared to S1 (10 kg/ha) and S3 (14 kg/ha). Maximum per cent germination (43.17%) recorded in seed rate of 10 kg/ha (S1) as compared to 12 kg/ha (S2) and 14 kg/ha (S3).

Interaction

Time taken for germination (days)

The data on interaction between dates of sowing and seed rates (DXS) on time taken for germination were found to be non-significant. The data on interaction between dates of sowing and seed rates (DXS) on germination percentage were also found to be non-significant.

Germination percentage (%)

The data on interaction between dates of sowing and seed rates (DXS) on time taken for germination were found to be non-significant. The data on interaction between dates of sowing and seed rates (DXS) on germination percentage were also found to be non-significant.

Table 1: Effect of sowing time and seed rate on time taken for germination (days) in Ashwagandha.

Sowing date(D)	Seed rate(S)			Mean
	S1(10kg/ha)	S2 (12 kg/ha)	S3 (14 kg/ha)	
D1 (August 15th)	9.33	9.67	8.67	9.22
D2 (August 30th)	9.78	8.89	10.44	9.70
Mean	9.56	9.28	9.56	

Factors	Sowing date (D)	Seed rate (S)	Interaction (DXS)
S.E m ±	0.46	0.56	0.79
CD (5%)	NS	NS	NS

Table 2: Effect of sowing time and seed rate on per cent germination (%) in Ashwagandha.

Sowing date(D)	Seed rate(S)			Mean
	S1(10kg/ha)	S2 (12 kg/ha)	S3 (14 kg/ha)	
D1 (August 15th)	43.89	41.71	44.21	43.27
D2 (August 30th)	42.45	42.24	43.13	42.60
Mean	43.17	41.97	41.97	

Factors	Sowing date (D)	Seed rate (S)	Interaction (DXS)
S.E m ±	0.06	0.08	0.11
CD (5%)	0.18	NS	NS

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