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STUDIES ON DIVERSE GENOTYPES OF ASHWAGANDHA FOR POTENTIAL HERBAGE YIELD FOR ANIMALS

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SUMMARY

The present field investigation was carried out on 15 genotypes of Ashwagandha at Medicinal and Aromatic plant section of Chaudhary Charan Singh Haryana Agricultural University, Hisar. The results based on average herbage yield of ashwagandha revealed that RAS-16 was the maximum herbage yield (88.00g/plant) producer followed by HWS-04-3 (76.33g/plant), HWS-116 (76.33g/plant), and HWS-108 (72.27g/plant). The results of present study on average seed yield basis discovered that HWS-116 was the maximum seed yield (7.87g/plant) producer followed by HWS-106 (7.43g/plant), HWS-110 (4.30g/plant), and HWS-108 (3.50g/plant) and HWS 100 (3.47g/plant). The correlation studies revealed that the herbage yield was found significantly and positively associated with dry root yield. As, these plant characters support the growth of each other.

Key words : Utilization, medicinal plant, Ashwagandha, health, feed, fodder

In India, about 20% of the world's livestock are reared for different of animal products on only 2.3% of the world geographical area. The shortage in feed/fodder has been recognized as one of the primary constraints in achieving desired level of livestock production (Bikas *et al.,* 2013). The rural people depend on livestock for their livelihood. India is the world's largest milk and fifth largest meat producer (National Accounts Statistics, 2016). Only 4% of the total cultivated region is related to fodder production. Most of the domestic animals fodder demand is satisfied by crop residues, forests, pastures and grazing lands. According of IGRFI Vision 2050, there is a net deficit of 61.1% green fodder, 21.9% dry crop residues and 64% feeds (Kumar *et al.,* 2018). The developing countries depend on shurbs and herbs available in forest, for curing human beings and domestic animals. Suitable model for intercropping of medicinal plants need to be developed with forest/horticulture and agricultural crops to optimize the production per unit area which help farmers in adopting commercial cultivation of medicinal and aromatic plants in a sustainable manner (Bimlendra and Nandal, 2010).

In early days, generally the livestock animals were brought to nearby grass land and forest area for grazing. During grazing the grass, they also in take the wild medicinal plants naturally grown there e.g. tumba, karela, ashawagandha, etc., this grazing on medicinally important plants keeps the livestock animals free from common diseases. Thus, these crops may serve as a source of feed of domestic animals and cultivated to produce high yields of feed/fodder, which are also rich in nutrients suitable for animal's requirements (Kumar *et al*., 2017). Present day, Ashwagandha (*Withania somnifera* L.) is most demanding herbs and known for the medicinal utility of its root alkaloids as immunity booster (Priyanka *et al*., 2020; Koli and Arya, 2022). Ashwagandha is most valuable herbal plant for Indian culture since ancient times (Koli *et al*. 2021). Milk production is a complex physiologic process involving physical factors and the interaction of multiple hormones. Galactagogues are medications or other substances believed to assist with initiation, maintenance or increase of milk production (Bharti *et al*., 2012). Although, Ashwagandha and satwari have been incorporated in polyherbal formulations/tablets used around the world for their alleged galactogogues properties, the specificity and power of the galactopoietic effect of the individual plants still remain to be validated (Behera *et al*., 2013).

There is urgent need to increasing the food, feed and fodder production in India to satisfy the hunger of domestic animals. Moreover, the problems related to nutrient deficiency and health is increasing

day by day. In addition to this, excessive exploitation of some important medicinal plants from their natural habitat have been reduced their status up to the endangered plants. These crop were found suitable for utilization as food, feed, fodder for domestic animals. The feeding of domestic animal on such crop in addition to other fodder crops improves the performance as well as health status of animals. In addition to this, feeding the animals on such plants also improves the quality of animal product (Kirti and Arya, 2019).

The cultivation of medicinal and aromatic plants will improve the cropping systems, and ultimately improve the fertility status of field. The utilization of waste land, marginal lands, and problematic soils for cultivation of medicinal and aromatic plants for feeding them to livestock animals through organic farming will increase the quality of end products, soil health, ecological environmental and economics of cultivation system. Ashwagandha is also found suitable for utilization as food, feed, fodder for domestic animals. The feeding of domestic animal on such crop in addition to other fodder crops will improve the performance as well as health status of animals and keep them free from major disease. In addition to this, feeding the animals on medicinal plants also improves the quality of animal products such as milk, meat and egg, but further research is recommended to optimize effects on animals (Kirti and Arya, 2019). Therefore, keeping above points related to ashwagandha in view, the study was carried to identify the suitable for herbage yield.

MATRIALS AND METHODS

In the present study, Ashwagandha 15 genotypes were selected for herbage yield from germplasm of Medicinal and Aromatic Plant Section of Chaudhary Charan Singh Haryana Agricultural University, Hisar. These genotypes were evaluated during late *kharif* 2020-21. The research farm is located at 29.09° N latitude and 75.43° E longitude in northern hemisphere. This place is elevated about 216 m above mean sea level. The data on weather parameters was recorded during the cropping season is presented in Fig. 1. The experiment was planted in randomized block design with three replications in the research field. All the recommended agromonic package of practices were followed to raise a good crop. Hisar (Haryana) lies on the outer margins of the south-west (SW) monsoon zone. Its climate is tropical monsoon type and is characterized as arid climate. The major features of this climate are dryness, extremes temperature and scanty rainfall. The average annual rainfall of experimental location is around 452 mm. The soil exhibits mixed pattern of Aeolian and Alluvial deposits. For this investigation, five plants were selected randomly for recording the all kind of observations. The characters on which the observation recorded were, namely, plant height (cm), days to 50% flowering, number of primary branches, number of secondary branches, number berries per plant, test weight, seed yield/plant (g), dry root yield/plant (g), and herbage yield/plant (g). The recorded data on above was subjected to statistical analysis as per the standard procedure.

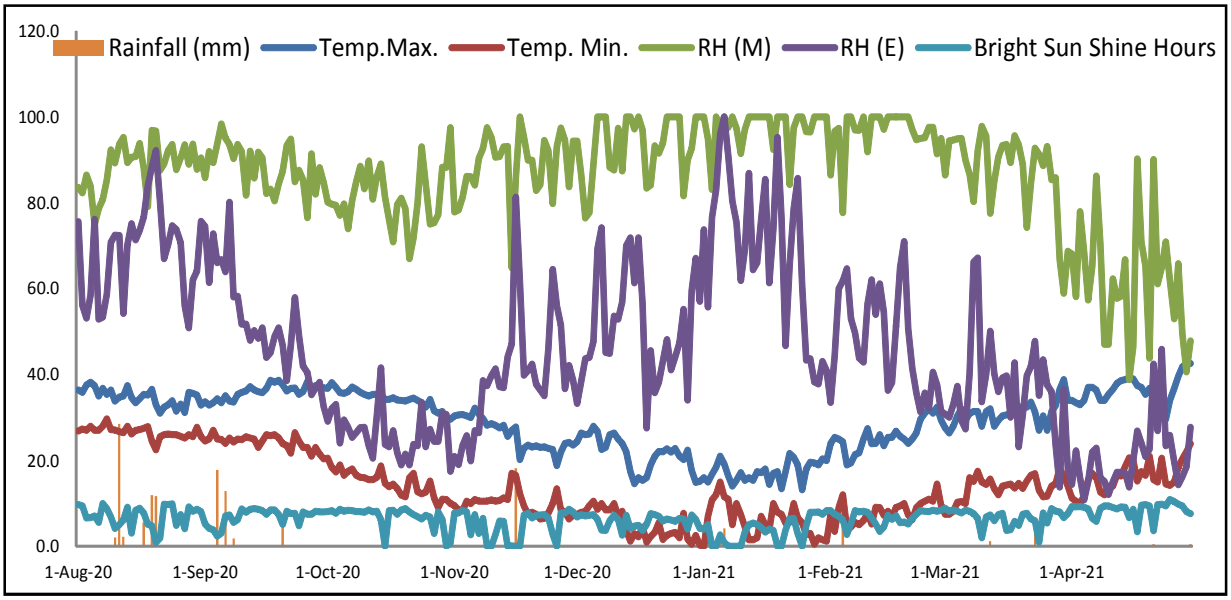

Fig. 1.Weather parameters recorded during the cropping season 2020-21 at Hisar

TABLE 1
Mean performance of herbage yield (g/plant) of ashwagandha and other traits

S. No.	Genotypes	Plant height (cm)	Days of 50% flowering	No. of primary branches	No. of secondary branches	No. of berries	1000-seed weight (g)	Seed yield (g/plant)	Herbage yield (g/plant)	Dry root yield (g/plant)
1.	RAS-16	61.27	80.00	3.00	11.67	80.00	1.83	2.84	88.00	34.67
2.	HWS-04-2	56.00	81.33	6.23	9.33	30.67	1.80	1.60	53.40	18.60
3.	HWS-04-3	64.07	81.00	4.10	4.20	79.00	1.82	1.58	76.33	28.67
4.	HWS-08-4	69.37	79.33	3.00	7.57	55.33	1.81	1.33	47.33	17.67
5.	HWS-08-6	51.43	76.33	3.33	6.00	48.67	1.82	1.40	50.67	22.00
6.	HWS-08-18	59.33	80.67	3.33	11.03	48.33	1.82	1.43	47.27	20.40
7.	HWS-100	51.50	73.67	5.57	11.57	104.67	1.80	3.47	33.33	15.00
8.	HWS-101	57.67	80.33	3.43	17.53	45.00	1.82	1.30	38.83	19.50
9.	HWS-102	60.37	83.67	2.90	12.97	15.00	1.80	0.70	21.83	12.00
10.	HWS-104	64.33	80.67	5.33	14.63	65.67	1.82	2.33	26.33	13.80
11.	HWS-105	63.00	76.00	4.57	16.90	51.67	1.83	2.20	34.67	18.00
12.	HWS-106	66.00	77.67	6.23	25.10	115.00	1.81	7.43	54.67	19.67
13.	HWS-108	64.33	80.33	4.87	18.10	88.00	1.83	3.50	72.27	18.23
14.	HWS-110	55.33	79.67	4.53	18.47	49.67	1.82	4.30	62.67	23.00
15.	HWS-116	81.33	75.33	4.33	18.73	152.67	1.80	7.87	76.33	25.00
	Mean	61.69	79.07	4.32	13.59	68.62	1.82	2.89	52.26	20.41
	S.E.	1.88	1.30	0.35	0.80	3.62	0.01	0.22	2.19	0.96
	C.V.	5.28	2.85	14.24	10.22	9.14	0.62	13.43	-0.66	8.18
	C.D. 5%	5.45	3.77	1.03	2.32	10.49	0.02	0.65	6.34	2.79

RESULTS AND DISCUSSION

Herbage yield and other traits

The analysis of variance of present study revealed the significant differences among all the traits. The results of present study are presented in table1. The results based on average herbage yield of ashwagandha revealed that RAS-16 was the maximum herbage yield (88.00 g/plant) producer followed by HWS-04-3 (76.33 g/plant), HWS-116 (76.33 g/plant), and HWS-108 (72.27 g/plant). However, average herbage yield of ashwagandha was recorded lowest in genotype HWS-102 (21.83 g/plant) followed by HWS-104 (26.33 g/plant), HWS-100 (33.33 g/plant) and HWS-105 (34.67 g/plant). The results of present investigation on average dry root yield basis revealed that RAS-16 was the maximum dry root yield (34.67 g/plant) producer followed by HWS-04-3 (28.67 g/plant), HWS-116 (25.00 g/plant), and HWS-110 (23.00 g/plant). However, average dry root yield of ashwagandha was recorded lowest in genotype HWS-102 (12.00 g/plant) followed by HWS-104 (13.80 g/plant), HWS-100 (15.00 g/plant) and HWS-08-4 (17.67 g/plant). The results of present study on average seed yield basis discovered that HWS-116 was the maximum seed yield (7.87 g/plant) producer followed by HWS-106 (7.43 g/plant), HWS-110 (4.30 g/plant), and HWS-108 (3.50 g/plant) and HWS 100 (3.47g/plant). However, average seed yield of ashwagandha was recorded lowest in genotype HWS-102 (0.70 g/plant) followed by HWS-106 (1.30 g/plant), HWS-08-4 (1.33 g/plant) and HWS-08-6 (1.40 g/plant). The above findings on ashwagandha were supported by Srivastava *et al*. (2018).

Character association

The character association studies play an important in selection of desirable plants on basis of association of a particular character with the yield. The results of association studies among the yield and other traits are presented in Table 2. The correlation studies revealed that the herbage yield was found significantly and positively associated with dry root yield. As, these plant characters support the growth of each other. Likewise, the seed was also found significantly and positively correlated with plant height, number of secondary branches per plant and number of berries per plant. Similar finding on ashwagandha were reported by Srivastava *et al*., 2018. As yield is a quantitative character, so direct selection of the genotypes simply

TABLE 2
Character association of herbage yield (g/plant) of ashwagandha with other traits

	DF	NPB	NSB	NB	TW	SYPP	DRY	HY
PH	-0.064	-0.035	0.311	0.583*	-0.078	0.533*	0.165	0.302
DF		-0.276	-0.172	-0.617*	0.089	-0.505	-0.051	-0.040
NPB			0.404	0.347	-0.172	0.477	-0.271	-0.108
NSB				0.390	0.067	0.703**	-0.169	-0.056
NB					-0.029	0.849**	0.320	0.460
TW						-0.169	0.347	0.307
SYPP							0.208	0.369
DRY								0.922**

Note - PH= Plant height (cm), DF= Days to 50% flowering, NPB=Number of primary branches, NSB= Number of secondary branches, NB= Number berries per plant, TW= Test weight, SYPP= Seed yield per plant, DRY= Dry root yield per plant, HY= Herbage yield per plant.

on the basis of yield, may or may not be effective. The information of inter- relationship among yield and its associate characters are of economic worthy for any plant breeding programme. The correlation study helped in the assessing the knowledge of inter- relationship among yield and its associate characters.

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