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Harvesting period management for production of quality roots of Ashwagandha (*Withania somnifera*.Dunal)

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ABSTRACT

A field experiment to study the effect of time of harvest on root yield and quality of Ashwagandha (*Withania somnifera* Dunal) was conducted at Nagarjun Medicinal Plants Garden, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra) during 2003-04. The treatments were comprised of five harvesting time viz., T₁-At flowering initiation, T₂- 50% flowering, T₃-100 % flowering, T₄-Berry ripening and T₅ -At maturity tried in Randomized Block Design with four replications. Significantly highest root yield was recorded with the harvesting at 100% flowering stage over all the treatments except berry ripening stage. The crude fibre content was also found to increase with the harvesting time and the highest fibre content was recorded at maturity stage. The total alkaloids content was significantly highest at 50% flowering stage followed by 100% flowering stage. The graded root yield was also influenced by harvesting time and significantly highest root yield of A grade was obtained at 100% flowering stage.

Key words : *Withania somnifera*, Root grading, Root quality

INTRODUCTION

Ashwagandha or Asgandh (*Withania somnifera* Dunal) is the member of nightshade family *i.e.* Solanaceae. It is an erect, herbaceous, evergreen, tomentose shrub with 13 to 50 cm height. The crop is being commercially cultivated on an area of around 10,000 ha in India mostly in Madhya Pradesh. Traditionally as a medicine Ashwagandha has been used in many ways, as a sedative, diuretic, a rejuvenating tonic. Ashwagandha roots are also used for a wide range of ailments including arthritic inflammation, insomnia, cough, nervous disorders, gynecological disorders, especially functional female and male fertility and impotence.

Ashwagandha has assumed great importance now a day due to its good domestic market value and potential. In market the roots are being sold in four grades on the basis of root quality. Roots with pencil thickness are the good quality roots, fetches fair prices in the market. The research work on the stages of harvesting and its effect of root quality is very meagre. Due to its constant demand, good market price and important medicinal value, area under Ashwagandha is increasing day by day.

The time of planting and harvesting of medicinal and aromatic plants are most crucial and important factors for

synthesis of secondary metabolites *i.e.* alkaloids. Besides that it is necessary to process a crude drug so as to preserve it for a longer time with quality and also to acquire better pharmaceutical elegance and therefore, to determine the stage of harvesting for maximum good quality root yield of Ashwagandha roots, the present investigations was undertaken.

MATERIALS AND METHODS

A field experiment to study the effect of time of harvest on root yield and quality of Ashwagandha (*Withania somnifera* Dunal) was conducted at Nagarjun Medicinal Plants Garden, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra) during 2003-04. The treatments were comprised of five harvesting time viz., T₁-At flowering initiation, T₂- 50% flowering, T₃-100 % flowering, T₄-Berry ripening and T₅ -At maturity tried in Randomized Block Design with four replications.

The harvesting of Ashwagandha for roots is usually done after 140-160days of sowing. The maturity of the crop was judged by drying of the leaves and turning of entire berries to red colour. In the present study the harvesting was done as per the treatments. The dried roots were beaten with a club to remove the adhering soil and

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the thin lateral roots and rootlets. The entire product was then carefully hand sorted into four grades as given below based on length and uniformity of the pieces.

Grade A: root pieces up to 7.00 cm length, solid, brittle, and inside white.

Grade B: root pieces up to 5.00 cm length, solid, brittle, and inside white.

Grade C: root pieces up to 3.00 to 5.00cm length, semisolid.

Grade D (low grade): small root semisolid, very thin, inside yellowish

The post harvest observations were recorded as per the treatments. The total alkaloid content was determined as per the titre-metric method (Anonymous, 1998) and crude fibre content was estimated by the method described by Chopra and Kanwar (1980)

RESULTS AND DISCUSSION

Dry root yield:

The root length was successively increased with the harvesting period. At the flower initiation stage root length was 11.6 cm and it was significantly increased up to berry ripening and maturity stage (19.5 cm) however, it was at par with 100% flowering stage. The root yield was also found significantly influenced by the harvesting period. Further, it was observed that the dry root yield was successively increased with the harvesting period up to 100 % flowering stage and significantly highest root yield was recorded with the harvesting at 100% flowering stage (T₃) however, it was at par with berry ripening (T₄) stage (Table 1).

Graded root yield:

The graded root yield was significantly influenced by harvesting period (Table 1). Further, it is noticed that the significantly highest root yield of A grade (1.689 q ha⁻¹) was obtained at 100% flowering stage. Similarly the

root yield of grade B (2.543 q ha⁻¹) was also registered highest at 100% flowering stage. However, it was at par with berry ripening stage. The data clearly showed that 75% (30+45%) i.e. 4.23 q ha⁻¹ root yield of A and B grades was recorded at 100% flowering stage, followed by 71% (27+44%) i.e. 3.89 q ha⁻¹ root yield of A and B grades due to berry ripening stage. Significantly highest root yield of C grade (43%) was noticed at maturity stage followed by flower initiation stage.

On examination of the data on graded root yield, the harvesting period between 100% flowering to berry ripening stage was the proper stage of harvesting of Ashwagandha.

Quality of roots:

The harvesting period also influenced the quality of Ashwagandha roots. The total alkaloids content (0.620 %) was significantly recorded highest at 100% flowering stage (T₃) followed by 50% flowering stage (T₂). The total alkaloid content was found to decrease with the harvesting at berry ripening and maturity stage however, the differences among all harvesting stages were non significant except flower initiation stage. Significantly lowest content (0.516 %) was noticed at flower initiation stage (T₁). Total alkaloids yield was significantly highest with 100% flowering stage over all the harvesting stages under study (Table 2).

The fibre content in Ashwagandha roots was in the range of 14.72 to 26.83% and the content was found to increase with the harvesting period (Table 2). Significantly highest fibre content was recorded at maturity stage (26.83%) followed by berry ripening stage. The higher fibre content of the roots is not desirable quality parameter in the market. These results are in accordance with the findings of Patel *et al.* (2003). They have also reported the increasing trend of root yield with harvesting period. The days required for 100% flowering to berry ripening

Table 1 : Root yield as influenced by harvesting period

Harvesting period	Duration (days)	Root length (cm)	Dry root yield (q ha ⁻¹)	Graded root yield (q ha ⁻¹)			
				A	B	C	D
T ₁ (Flower initiation)	80	11.6	2.67	0.294 (11)	0.774 (29)	0.987 (37)	0.614 (23)
T ₂ (50 % flowering)	90	16.4	4.39	1.519 (35)	1.828 (42)	0.651 (15)	0.347 (8)
T ₃ (100 % flowering)	110	19.4	5.64	1.689 (30)	2.543 (45)	0.676 (12)	0.732 (13)
T ₄ (Berry ripening)	140	19.5	5.47	1.479 (27)	2.410 (44)	0.821 (15)	0.760 (14)
T ₅ (Maturity)	160	19.5	5.42	0.975 (18)	1.573 (29)	2.330 (43)	0.542 (10)
S.E. (m) ±	---	0.411	0.23	0.053	0.087	0.061	0.039
C.D. (P=0.05)	---	1.267	0.709	0.164	0.267	0.189	0.121
C.V. (%)	---	4.79	9.78	8.98	9.52	11.23	13.15

Figures in parenthesis refer to the per cent yield of dry root yield.

Table 2: Root quality of Ashwagandha as influenced by harvesting period

Harvesting period	Total alkaloid (%)	Alkaloid yield (q ha ⁻¹)	Crude fibre (%)
T ₁ (Flower initiation)	0.516	1.372	14.72
T ₂ (50 % flowering)	0.617	2.682	24.09
T ₃ (100 % flowering)	0.620	3.500	23.67
T ₄ (Berry ripening)	0.598	3.282	26.10
T ₅ (Maturity)	0.595	3.222	26.83
S.E. (m) ±	0.019	0.202	0.69
C.D. (P=0.05)	0.059	0.624	2.10
C.V. (%)	6.60	14.40	6.09

stage of Ashwagandha during the present investigation were in between 120 to 150 days, respectively. The research work carried out at Mandsaur centre of AICRP on medicinal and aromatic plants revealed that the total alkaloids and crude fibre contents of the roots increased from flower initiation to maturity stage. The crude fibre content was low at berry ripening stage as compared to maturity stage and it was concluded that the Ashwagandha crop should be harvested at berry ripening stage (Anonymous, 2003).

In the present study, although significantly highest root yield was recorded with 100% flowering stage and the yield recorded at berry ripening stage was at par, indicated the harvesting period of Ashwagandha crop in between 100 % flowering to berry ripening stage was the proper harvesting period for obtaining higher root yield with good quality parameters.

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