

## Nagori ashwagandha: A viable alternative crop for arid ecosystem

**India is a vast country with a wide range of agro-climatic conditions. Medicinal crops like ashwagandha are very sensitive to soil and climatic conditions. Region specific cultivation has the potential to provide benefits in terms of environmental protection, conservation of species and improved raw drug quality. India is bestowed with a lot of potential to produce medicinal crops in particular agro-ecological regions because the country has diverse agro-climatic regions. Therefore, region specific cultivation of ashwagandha for better performance under sandy plains of central to western Rajasthan will be targeted. Keeping in view the above facts, ashwagandha elite (DTWr-1) should be cultivated in particular agro-climatic pockets to boost the productivity and quality of raw drug. At the same time, farmers can earn more than ₹ 2.5 to 3.00 Lakhs per hectare within 180-185 days under Chahi condition of sandy plains of central to western Rajasthan.**

**W**ITHANIA *somnifera* L. Dunal is also known as Asgandh, Ashwagandha, Winter Cherry, Indian ginseng in different regions as well language. *Withania* refers to the 'primary extract of plants' and *somnifera* means 'sleep-inducing' drug. Ashwagandha is named because it smells like a horse and person consuming root extract may develop strength and vitality similar to horse. It is an herb used in Ayurvedic medicine in the traditional system from long back. Ashwagandha was first mentioned by learned Punarvasu Atreya over 4000 years ago. Subsequently the medicinal properties of this plant were mentioned in Ayurvedic treatises such as Charaka Samhita, Sushruta Samhita, Astanga Hridaya, Bhava Prakasha Nighantu etc.

It is widely used as a tonic and a sedative in several countries due to its adaptogenic properties. Roots extract slow down the ageing process, increase longevity and mental as well as physical strength. It is also referred to as a 'Royal Herb' possessing multiple therapeutic effects in the different human body systems (immune system, neurological and endocrinal system, the aerobic energy-production system) including reproductive system. In Ayurveda, it has aphrodisiac, sedative, anxiolytic, rejuvenating and life-prolonging properties. The root extract or powder has been traditionally used to promote youthful vigour, endurance, strength, health, and increasing the production of vital fluids, muscle fat, blood, lymph, semen, and cells. It acts as a stimulant, thus increasing the sperm count.

### Plant part used

The part used is the dried root, traditionally used as a powder and dry extract. Consistent with this,

ashwagandha use has been described primarily for its root in national pharmacopeias, such as the United States Pharmacopeia (USP), the British Pharmacopoeia, the



Ashwagandha

Indian Pharmacopoeia, the Ayurvedic Pharmacopoeia, and reference works like the World Health Organization monograph. Most companies manufacture *W. somnifera* root extract from dried roots, which is in agreement with the use of Ashwagandha in traditional Ayurvedic medicine. Methanol, hexane and diethyl ether extracts, alkaloid and steroidal active constituents shared in the roots are reported to contain starch, reducing sugars, glycosides, dulcitol, etc., as a neutral compound. The amino acids reported from the roots include aspartic acid and glycine. Active constituents are methanol, hexane and diethyl ether extracts, Withaferin-A from leaves taste bitter and used in painful swellings and fever. Mainly, extract yield is ten times lower than the initial weight of raw material. The extract contains steroidal lactones called withanolides in concentrations between 1.5-5.0% (w/w).

This 'Nagori Ashwagandha' naturally grows in Nagaur district and the boundary area of Sikar, Jaipur, Ajmer, Pali, Jodhpur, Bikaner and Churu districts. It is a local variety/land race that dwells in a particular phyto-geographic region differing from others in climate and edaphic characters. Annual rainfall of the region is 450-500 mm and 80% received in the monsoon season. Region lies in the desert having extremes heat in summer and cold in winter. Soils of the region are sandy loam to sandy type. Plants are naturally grown in this region as a weed with gram, wheat, onion, mustard etc., in *rabi* season (October to May) under irrigated condition (Chahi). Superior quality of produce is obtained in this particular region. One of the most popular and rich in quality parameters are also known as 'Nagori Ashgand'. It has brittle and starchy roots. The 'Nagori Ashwagandha' is the supreme among all Ashwagandha varieties in arid region.

#### Botanical description of DTWr-1

It is a dense, hairy, erect, grayish-tomentose herb, grows up to a height of 1.5 meter. Its all parts are covered with whitish, stellate trichomes. Branching is extensive; leaves are simple, alternate or sub-opposite, ovate, entire, basis cunate, 11-13 cm long. The roots are very stout, long tuberous, fleshy, brittle and whitish-brown. The flowers are greenish-yellow and found in few flowered clusters in axils; pedicels up to 3.8 to 4.2 mm long. The fruit is red-yellow berry, smooth, 5-6 mm in diameter, enclosed in the inflated calyx which reaches more than 16-17 mm diameter and is globose, slightly 5-angled, pointed with the connivent calyx-teeth and scurfy pubescent outside. Seeds are 2.0-2.2 mm in diameter, yellow and somewhat scurfy. Overall, DTWr-1 seems diverse as compared to Nagori type and check variety.

#### Agro-technique and economics

*Withania somnifera* is native to India and distributed in Pakistan, Sri Lanka, South Africa, Iraq, Iran, Syria, and Turkey. It is also globally grown in arid as well as semi-arid regions. In India, ashwagandha is commercially cultivated in Rajasthan, Madhya Pradesh, Gujarat, Maharashtra, Haryana, Punjab, Karnataka, and Uttar Pradesh provinces. It naturally grows throughout hotter parts of India particularly on waste places. Overall, approximately 10,770 hectares of land are used to grow



Long tuberous, stout and brittle roots of Ashwagandha elite DTWr-1

Ashwagandha with an annual production of 8429 metric tonnes. 'Nagori Ashwagandha' is very much important in terms of their immense health promoting effects as well as from economic point of view as this plant has been enlisted among high demand medicinal species. If appropriate region specific cultivation of this plant can be done, that will be of huge impact over quality and quantity of the raw materials. This can ensure supply of good quality raw as well as formulated materials in both national and overseas market, ultimately thrust to increase their demand and good monetary return to the growers. The small sand mixed seeds are sown directly in the main field by broadcasting. After receiving two showers, the field is thoroughly prepared, divided into plots of convenient sizes and the seeds are sown during the second week of September. Plant-to-plant (12-15 cm) and row-to-row (40 cm) distance can be adjusted according to soil fertility. The population of 'Nagori Ashwagandha' plants should be more than 2,50,000 per hectare required for potential yield. The seeds are usually sown about 0.5 cm deep in month of September-October. The seeds in the field are sown in lines and covered with a layer of soil. The germination commences within 20-30 days of sowing. About 3.5 to 4 kg of seeds are required for sowing in one hectare. A light shower or irrigation up to 15 days after sowing ensures good germination.

Naturally the plants of 'Nagori Ashwagandha' are grown in social forestry parts of villages as a weed in central to western part of Rajasthan. Other than this social forestry area, the plants are also found in field borders,



Yellow paper wasps on flower of on elite DTWr-1

near tree trunks (ber, khejri etc.) in fields especially in *rabi* crops like gram, wheat, mustard and seed spices. The plant is known as 'Askand' and 'padalsingh' in central Rajasthan. The onset of flowering takes place during the winter season and crop mature in the month of March-April while in fallow fields the crop was harvested in the month of February-March.

Yellow paper wasp is very useful for pest and pollination management in Ashwagandha. Visiting time of this wasp is morning hours (8.30-10.30AM) for nectar purpose. While foraging for these food supplies, especially nectar, the yellow paper wasps are able to simultaneously pollinate flowers. DTWr-1 has maximum 6 to 7 flower buds in per bunch per node. Generally four to six berries set individually at one node.

The herb grows indeterminably, therefore, berries mature from lower side to upward. These fully mature



Different berry stages and mature berries damaged by Red-Vented Bulbul in DTWr-1

coloured berries are eaten by the birds especially by red-vented bulbul locally known as *Goliya*. This bird prefer 'DTWr-1' mature berries as a food material. Ashwagandha flowers, fruit and seeds also have potent diuretic, aphrodisiac property and used for treating infectious diseases / parasitic invasions. These birds also act as carrier for spread of seeds through excretions and help in conservation of this land race. Birds ingest the red berries, move through the digestive system and pass out along with droppings. These drop outs of birds having seeds fall on ground near trees etc. This fecal material gives off nutrients along with better water retention on ground surface during rain/irrigation for improved seeds germination.

The Ashwagandha 'Nagori type' and our elite 'DTWr-1' was selected decisively for comparing with variety JA-134 at farmer's field in sandy plains of Rajasthan. Accession 'DTWr-1' had maximum Specific Leaf Area (SLA) with straight and brittle roots at crop maturity stage as compared to Nagori type and check. All three were planted in the post rainy season (Third week of September) in one *bigha* near Bikaner to observe fresh root yield and dry root yield. DTWr-1 recorded maximum fresh root yield (11.02 q/bigha), Nagori type (10.07 q/bigha), whereas average fresh root yield in check variety (JA-134) was 5.12 q/bigha with two secured irrigation. The herb plant/roots are also collected by local nomads (*Ghandhelya*) after harvesting of *rabi* season crops in the month of March-April and fallow fields. The fresh roots of this crop were sold just after harvesting at a high price (₹ 10,000-11,000/q) in the local market. Overall, farmers of central to western Rajasthan especially in sandy plains can earn about ₹ 2.5 to 3.00 Lakhs per hectare through cultivation of 'Nagori Ashwagandha' in six months. Both the materials were also compared at Directorate field and recorded significantly high root yield in 'Nagori type' as compared to check.

## SUMMARY

Ashwagandha is an important hardy and drought tolerant root medicinal herb. It is a profitable venture for growing in sandy soils even in culturable wasteland and not preferred as a feed by wild animals. Integration of this crop into existing farming systems could be considered as high returns per rupee investment, potential crop as compared to cumin, gram and other *rabi* crops of central Rajasthan. DTWr-1 is a diverse and high yielding accession as compared to Nagori type. 'Nagori Ashwagandha' growers not only fetched remunerative income but additionally generated employment for local nomads' involved in harvesting/collection and primary processing. Overall, cultivation of land race Nagori and 'DTWr-1' is a profitable venture as compared to checks (JA-137).

For further interaction, please write to:

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