Title of the technology

Optimum harvesting time of important medicinal plants of Rajasthan for their secondary metabolites

A. Nature of technology

Harvesting technology for important medicinal plants of Rajasthan

B. Process in brief

The biosynthesis of secondary metabolites although controlled by genetic factors is affected by environmental influences, developmental stages, functionally different plant parts. As a result there are fluctuations in the concentration and quantities of secondary metabolites. Only on a few medicinal plants, data is available on this aspect. With a view, to improve the quality of plant based drugs, to ascertain the optimum concentration of chemical constituents responsible for medicinal properties and to provide scientific basis (time of collection/harvesting) for therapeutic purposes best time of harvesting of some of the important medicinal plants of arid zone viz. *Calotropis procera, Tribulus rajasthanensis* and *Pluchea lanceolata* was determined.
Flowers of *Calotropis procera,* a widely distributed impressing perennial shrub Fig. 1&2), have

Fig. 1-*Calotropis procera*-Plant

Fig. 2-*Calotropis procera*-Flowers

been found to be highly medicinal with bitter, digestive, astringent, anthelmintic, tonic, anti-inflammatory, spasmolytic, hepatoprotective, antioxidant and anti cancerous properties. *Pluchea lanceolata,* is an important wildly occurring medicinal plant of Rajasthan and used in Ayurvedic system of medicine for treatment of rheumatoid arthritis. *Tribulus rajasthanensis* is an endemic

species of Rajasthan, rich in saponins and commonly found in western Rajasthan. Of these, *Calotropis* flowers and *Pluchea lanceolata* plants are collected and sold in the market for their medicinal values.

Seasonal variations were found in secondary metabolite content of *Calotropis procera* flowers varied among agroclimatic zones (ACZ) also. Individually alkaloid content (total) was maximum in summers (4.0%) and minimum in monsoon season (2.54 %); sterol content (total) was maximum during winters (2.97%) and lowest in monsoon (2.38%) and flavonoid content was maximum in winters (75.8 mg CE/100 g) and minimum during monsoon season (61.2 mg CE/100g). Secondary metabolites in *Calotropis procera* flowers. The petroleum ether extract was maximum in ACZ IIIA (1.98%) and minimum in ACZ IA (1.42%) and IIA (1.41%). The yield of methanol extract was maximum from ACZ V and minimum from ACZ IIIA (7.05%) and IB (7.65%). Maximum total sterol content (2.65 %) and total alkaloids content (8.03 %) was obtained from agro-climatic zone ACZ IA. For highest concentration of secondary metabolites, *Calotropis procera* flowers should be harvested from Jaisalmer region in Rajasthan.

The variation in total secondary metabolite content in the leaves of *P. lanceolata* depended on the stage of plant development. Secondary metabolite content in leaves of *Pluchea lanceolata* increased from vegetative stage to the flowering stage and then decreased again in the post fruiting stage. Maximum content was found in the flowering stage (7.3 %).

The variation in total saponin content in the aerial parts of *T. rajasthanensis* depended on the stage of plant development. Saponin content increased in the vegetative stage (5.45 %) then decreased in the flowering stage (4.1%) and rises again (5.4 %) in the fruiting stage. Total saponin content in fruits is (1.5%) much less as compared to that present in aerial parts.

Results indicated that harvesting of *Calotropis procera* flowers for extracts rich in total secondary metabolites should be done in the month of August. But for individual secondary metabolites viz. alkaloids, one should harvest flowers in summers, for sterols and flavonoids, flowers should be collected in winters.

C. Beneficiaries of the technology

1. **Prominent beneficiaries/ user groups** : Rural population and pharmaceutical companies are the main beneficiaries.

2. ***No. of clients to whom technology has been transferred/ sold –*** Not yet transferred/sold.

3. ***Potential for further dissemination (As the case may be)*** – Yes

Following papers have been published for dissemination of technology.

i. Rathore M and Meena RK. (2010). Potential of utilizing *Calotropis procera* flower biomass as a renewable source of energy. *J Phytology*, **2(1):** 78-83.
ii. Mala Rathore M and Meena RK (2010). Variation in saponin content of *Tribulus rajasthanensis* Bhandari et Sharma in different developmental stages. *J. Economic and Taxonomic Botany*. **34(1)** : 182-185.
iii. Rathore M. (2010). Chemical Constituents from *Calotropis procera* – the Giant Milkweed in *ENVIS Forestry Bulletin.* **10(1):** 172-180.

D. Economic significance

1. ***Potential to address Livelihood issues and generate additional income:***
2. Raw material rich in secondary metabolites from medicinal plants will be of higher quality and will therefore fetch the collectors higher price for their material. Quality raw material will help in preparation of high quality Ayurvedic formulations and thus help generate income.

3. **Productivity enhancement and economic benefits over replaced technology** – Not applicable

Impact of technology –Not yet tested.

E. Developed by {Name *of Scientist(s)/ Officer (s)*}

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