Range of Seasonal Phytochemical Variations in *Calotropis procera* (Ait.) R.Br.

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**Abstract:** Phytochemical estimations had been carried out for the different plant parts viz., apical bud (AB), mature leaves (ML), stem (ST), whole plant (WP) and Flower (FL) of *Calotropis procera* (Ait.) R.Br. Whole plant includes only aerial plant parts. The investigations have been carried out for three seasons; winter, summer and monsoon. The seasonal variations among the plant parts have been investigated to ascertain the phytochemical changes occurring in the plant. The tests carried out were for protein, carbohydrate, tannin, phenol, fixed oil and essential oil content.

**Keywords:** *Calotropis procera*; phytochemicals; seasonal variations.

**Introduction**

The classical literature on Ayurveda, advocates firmly the season and the time of collection for a plant. This poised a question to a modern mind. The present work was carried out to find an answer to the question in a scientific way.

*Calotropis procera* (Ait.) R.Br., commonly known as *Arka*, is an important medicinal plant both for Ayurveda and traditional science of ethnomedicine. *Arka* was found sculptured on Shiva temple (Gupta 1996) symbolizing mythological and the medicinal importance enjoyed by the plant. Taxon is distributed in tropical and subtropical regions of Asia and Africa and is cosmopolitan in distribution. It is widely distributed in arid to semiarid regions of Caribbean, Central America, South America (Little et al. 1974), Israel, North Western and Central India, Sindh, Punjab, Upper Bengal, Bihar and drier climate of the South (Nadkarni 1983).

It has been widely used in the Sudanese medicinal system (Ayoub and Kingston 1981; Ayoub and Svendsen 1981), Unani system of medicine (Anderson 1988) and Arabic medicine system (Abulfatih 1987). In the traditional Indian medicinal system, different parts of the plant have been advocated for a variety of diseased conditions (Warrier et al. 1994). The plant parts employed for their medicinal properties are apical bud, mature leaves, stem and stem bark, flowers, root and root bark and latex.

In Indian traditional medicine, different parts of the plant have been used as purgative, anthelmintic and also in the treatment of diseases, such as leprosy, ulcers, tumors and piles, disorders of spleen, liver and abdomen (Kirtikar and Basu 1991) and as antidote to snake poisoning (Nadkarni 1983). The latex has been mentioned to be used as an abortifacient (Anonymous 1992) and leaves are reported to cure abdominal pain (Chopra et al. 1956). The flowers are put in oil and applied to wounds to cure them; the milky juice of the plant is also used with different ingredients (Rastogi and Mehrotra 2004). The tender and fresh leaves are often used in the indigenous system of medicine to cure fits and convulsion in children. The tender leaves of *C. procera* are also used to cure migraine (Prasad 1985).

**Materials and methods**

The investigation was carried out on taxon *Calotropis procera* (Ait.) R. Br. The seasonal consideration was: winter (December – January), summer (April-May) and monsoon (July – August). The samples were collected during...
these months as they were considered as the pick months for that particular season.

**Collection, drying and storage**

The plant material was collected from Surat and the nearby area. It was brought to the laboratory. Material was washed 3-4 times, thoroughly under running tap water to remove dust particles and other debris. Apical bud, mature leaves and flowers were kept directly for drying while stem and whole plant were first cut into the small pieces. It was then spread over the blotting paper under the fan to dry out the surface water. Next day the plant material was kept in oven at 40°C for three days. Dried plant material was then ground to powder and stored in air tight container.

**Phytochemical estimations**

Phytochemical analysis includes quantitative estimation of the protein, carbohydrates, tannins, phenols, fixed oil and essential oil content. Methods employed were as follows.

- Proteins (Lowry et al. 1951)
- Total Carbohydrates (Anthrone method: Sadasivam and Manickam 1996)
- Tannin (Folin Denis method of Schanderi 1970)
- Phenol (Folin Ciocalteau method of Swain and Hills 1959)
- Fixed oil content (Soxhlet method of Agarwal et al. 1987)
- Essential oil (Anonymous 2001)

**Results**

**Protein content**

Amongst all the investigated phytochemicals, species is rich in protein content. All the plant parts have shown the highest protein content during summer season except apical bud in which slightly higher content was found during winter (Figure 1). The protein content was found lowest in the winter sample of flowers (6.50g%) and the maximum was reported in the summer sample of mature leaf (19.99g%). Pronounced seasonal variations in protein content were observed for mature leaves and flowers. Winter was found to be less in protein content except apical bud, where the protein content was almost identical in summer and winter.

**Carbohydrate content**

Carbohydrate content was next to protein in concentration. Modest seasonal variations were noted in the carbohydrate content of apical bud, mature leaves and whole plant. Apical bud and mature leaf both exhibited higher carbohydrate content during summer while rests of the plant parts were at highest during winter. There was a drastic decrease in carbohydrate content of flower in the summer sample (9.45g%) than in winter (18.46g%). Thus the variation ranges up to almost 50%. The same holds true for stem monsoon sample (Figure 2).
**Tannin content**

Compared to other phytochemicals, tannin was found less in the taxon. Stem and whole plant possess lesser amount of tannins compared to other parts whereas the terminal plant parts viz. apical bud and flowers showed high tannin content. Except stem and whole plant, all the parts showed higher tannin content during monsoon (Figure 3).

![Figure 3: Comparison of Tannin content.](image)

**Phenol content**

The taxon was found low on phenol too. All the plant parts were more or less similar in having phenol content. However, the winter sample of apical bud did show slightly higher phenol content and it was found almost nil in the monsoon sample of stem. The apical bud, mature leaf and stem samples of winter had shown the maximum phenol content while in whole plant and flower, monsoon samples possessed the maximum. Summer was found to be the moderate season for all the plant parts (Figure 4).

![Figure 4: Comparison of Phenol content.](image)

**Fixed oil**

Apical buds showed higher fixed oil content among all the plant parts followed by mature leaves, whole plant, stem and flower. Seasonal variation was not pronounced in the fixed oil content of *C. procera* (Figure 5).

![Figure 5: Comparison of Fixed oil content.](image)

**Essential oil**

Essential oil has been determined Nil in all the plant parts.

**Discussion**

Seasonal variation is pronounced in different phytochemical content of a taxon investigated. The effect of season is not uniform for all the phytochemicals or for all the organs investigated. This is perhaps due to the fact that the different organs would obviously have different physiology and different functions. Protein was at its highest in summer in all the organs but in flowers more pronounced. Next to protein were the carbohydrates. Once again most plant parts exhibited highest carbohydrate concentration in summer. Tannin, in general, is present in low amount as compared to other phytochemicals except phenol, however the apical bud showed highest concentration of tannin, in monsoon samples and stem was highest in tannin during summer. Phenol, just like tannin, was also reported to be low in this taxon. The apical bud showed higher concentration of phenol in winter. Fixed oil was also in higher concentration in apical bud and was not susceptible to seasons.
Conclusion

Such studies are helpful in deciding the proper season of collection for that particular plant or part of the plant. Once the active phytochemical is ascertained and its higher concentration is adjudged, the collection at an appointed point of year can assure the best quality of the raw material and ultimately a good quality drug.

References


