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SHORT COMMUNICATIONS

Seasonal variation in the content of sennoside in Senna leaves

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ABSTRACT

Cassia acutifolia (Alexandrian Senna) and *C.angustifolia* (Tinnevelly Senna) have great medicinal value because of sennosides, in leaves and pods, used as purgatives. The seasonal variation of sennoside in leaves of these species was studied from January to December 1975.

A decline in the sennoside content was observed in both species with the onset of flowering and fruiting. A fall in the sennoside content was also observed during the rainy season. This fall was experimentally shown to be due to the leaching effect of rain. After the rainy season the plants shed their old leaves and newly sprouted leaves contained a very high percentage of sennosides, which again declined on maturation.
(Pharm. Weekblad. Sci. Ed. *1*, 30-32).

INTRODUCTION

Senna has a restricted world distribution. It is reported to occur in Sudan, South Arabia and Sind (Pakistan). In India, *Cassia angustifolia* Vahl. (Tinnevelly Senna) and *C. acutifolia* Del. (Alexandrian Senna), are found wild in the Kutch region of Gujarat. The plants have great medicinal importance because of their content of sennoside, which are used as purgatives. The sennosides are a mixture of dianthrone glycosides, and are known as sennosides A, B, C and D (STOLL *et al.* 1949; LEMLI and CUVEELE 1965; SCHMID and ANGLINKER 1965). Such compounds have also been reported in *Rheum palmatum* (ZWAVING 1972). LOHAR *et al.* (1975) phytochemically analysed different *Cassia* species for their sennoside content and found that *C. angustifolia* contained the highest percentage of sennosides.

India is the largest supplier of Senna leaves and pods to the world market. The production has a value at over five million rupees annually (GUPTA 1971). In the present study an attempt has been made to analyse the leaves from both Cassia species for their sennoside content in relation to seasonal variation.

MATERIAL AND METHODS

Certified seeds of *C. angustifolia* (I.C. No. 19658) and *C. acutifolia* (I.C. No. 106777) species of Senna were obtained from DR. RAJENDRA GUPTA, IARI, New Delhi. Since the seeds possessed hard seed coats they were chemically scarified with concentrated sulphuric acid for 10 minutes and subsequently washed in running water for three hours before being sown in flower beds in the university botanical garden at the end of July 1974. The beds were watered once in three days.

The leaves at 6th, 7th and 8th nodes of the main shoot from the apex of both species, were collected during the second week of each month from January to December 1975. The plant stages were recorded simultaneously.

The method of FAIRBAIRN and MICHAELS (1950), modified by the Joint Committee of the Pharmaceutical Society (1965), was used for the estimation of the sennoside content. The chemical assay of the oven dried (50°C) leaf samples was performed after removal of the free aglucones using chloroform and ethyl ether. The amount of sennosides was determined after extraction of the glycosides and hydrolysis, oxidation of the free aglucones to anthraquinones by means of hydrogen peroxide, extraction of the anthraquinones and application of the reaction of Bornträger, using 1 *N* sodium hydroxide solution. The determination was carried out at the wavelength of maximum absorbance (515 and 440 nm). The observations are recorded in Table I.

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RESULTS AND DISCUSSION

C. angustifolia Vahl.

The plants of *C. angustifolia* remained vegetative until February 1975 without any significant change in the sennoside content. The plants began flowering during April and the sennoside content started decreasing at the same time. This trend was continued until June, when the plants entered the fruiting stage. The sennoside content further decreased with the maturation of the fruits. Simultaneously the rain started and a considerable decrease in the sennoside content was observed in July and August. At the end of the rainy season the plants shed their old leaves, and new leaves sprouted simultaneously. A remarkable increase in the sennoside content was observed in the new leaves in September and a further increase was observed in October. This sennoside content was than 8.65% as compared to 4.33% in January. In November and December again a declining trend was observed. In December this content was 4.42% and the plants again entered the flowering stage (Table 1).

C. acutifolia Del.

C. acutifolia which exhibited a lower content of sennosides as compared to *C. angustifolia*, expressed more or less a similar trend for seasonal variation of the sennoside content. The flowering and fruiting were delayed by one month in *C. acutifolia.* Also in *C. acutifolia* the sennoside content exhibited a remarkable decrease in the rainy season, the months of July and August. An increasing trend was obtained in the months of September and October. In October the content of sennosides was 6.44% as compared to 2.80% in January. In the months of November and December again a decreasing trend was observed in the sennoside content (Table 1).

It was presumed that the reason for a further decrease in the sennoside content in the months of July and August might be due to a leaching effect caused by the rain. To prove this effect ten plants of each species raised in experimental plots were selected. These plants were sprayed with water, by means of an automiser to simulate the rain, in the first week of September 1976, both in the morning and in the evening for one hour during seven days. An equal number of plants were left unsprayed as control. The leaves at 6th, 7th and 8th nodes from the apex on the main shoot were collected from the sprayed and the unsprayed plants and were oven dried (50°C) for the analysis of their sennoside content. It was observed that

TABLE 1. *Seasonal variations in the percentage of sennosides in the leaves of C. angustifolia and C. acutifolia during 1975*

Months of observation	*C. angustifolia*		*C. acutifolia*	
	Percentage of sennosides on dry weight basis	Plant stage	Percentage of sennosides on dry weight basis	Plant stage
January	4.33	vegetative	2.80	vegetative
February	4.23	,,	2.40	,,
March	4.32	,,	2.50	,,
April	3.94	flowering	2.90	,,
May	3.08	flowering and fruiting	2.60	flowering
June	2.53	,,	2.69	,,
July	2.68	fruiting	2.31	fruiting
August	2.68	leaf fall	2.21	leaf fall
September	7.12	sprouting leaves	4.61	sprouting leaves
October	8.65	vegetative	6.44	vegetative
November	5.90	,,	4.80	,,
December	4.42	flowering	3.17	,,

TABLE II. *Effect of water spray on leaves on sennosides content in C. angustifolia and C. acutifolia*

	C. angustifolia	*C. acutifolia*
Percentage of sennosides in unsprayed leaves on dry weight basis	6.72	4.50
Percentage of sennosides in sprayed leaves on dry weight basis	5.45	3.62

spraying of plants with water caused a decline in sennosides content in the leaves as compared to those of unsprayed plants (Table II).

DANE *et al.* (1972) studied the development of glycosides during the growth of the leaves of *Cassia angustifolia.* Their observations showed an interesting correlation between growth and development of the constituents: the leaflets attain a maximum percentage of sennosides after 90 days.

SABER *et al.* (1961, 1962) reported that the content of total sennosides in *C. acutifolia* leaves was highest at the flowering stage of the plant. FAIRBAIRN and SHRESTHA (1967) reported that significant quantities of glycosides appear in young leaves and that they are translocated to flowers and ovaries where they accumulate. The results of the present investigations are not in agreement with those of SABER *et al.* (1961, 1962). During the present study a decrease in sennoside content was observed in both Cassia species after flowering began. This is in agreement with the observations made by FAIRBAIRN and SHRESTHA (1967); they showed that an increase in the sennoside content was observed in young leaves of both species and that it declined with the induction of flowering and fruiting. However, after maturation of the fruits a further decline in the sennoside content was observed due to a leaching effect of rain. This effect of rain was confirmed when plants were artificially sprayed with water and analysed for their sennoside content. Continuous raining has been reported to spoil the quality of senna leaves (cf. *Wealth of India* 1950).

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