

PHYTOSTEROLS LEVEL IN THE SUCCULENT BAMBOO SHOOT AT DIFFERENT STAGES OF CULM GROWTH

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ABSTRACT

Estimation of phytosterols at the different age of culm growth were studied in *Bambusa balcooa* grown in Manipur, India. The aim of the study is to find out whether the accumulation of phytosterol has any relation with age and height of culms. The result showed that the level of phytosterols increased with the age of the culm at least upto 18 days and afterwards it declined considerably upto 27 days. The scales discarded from the culms of different height also contain considerable amount of phytosterols and comprised nearly 44 to 48 % of the total fresh weight of the culms and with the increased in height of the culm, the weight of scales declined and simultaneously, the delicate portion also decreased. Further, fermentation of the succulent bamboo shoot resulted in an enrichment of phytosterols from 0.08 to 0.6 % dry weight.

INTRODUCTION

Phytosterols, which are the precursors of many pharmaceuticals active steroids, are secondary plant products found in high quantity in many plants (Jain et al, 1980, Asolkar and Chandha, 1979). In this connection, the presence of phytosterols in bamboo plants has been reported (Sarangthem et al.1998). This paper revealed the essentiality of selecting the appropriate mature succulent bamboo shoot (culm) as raw materials for extraction and isolation of phytosterols for use in preparing pharmaceutical drugs.

MATERIALS AND METHODS

This study was carried out at the "Plant physiology research laboratory, Department of Life Science, Manipur University over a period of from 1996-1998" in order to assess whether the accumulation of phytosterols has any relation with the age and height of culms, the fresh succulent shoots of *Bambusa balcooa* of different height (cm) and age of growth (days) were collected from different localities of Manipur. And the shoot apices and scales were removed and weighed simultaneously, the delicate shoot apices were sliced uniformly and kept in the oven at 60°C for 12 hrs. Likewise the outer scales were sliced after removing the dark shining bristles and dried in the oven as previously done. The dried samples were then powdered and the concentration of total phytosterols were determined colorimetrically using the Liebermann-Burchard reagent (Katayama, 1974).

For enrichment of sterols during anaerobic digestion, fermentation of the fresh succulent bamboo shoots of 6, 18, and 24 days old were done by inoculating the thin slices with the exudates obtained from the already fermented slices of bamboo shoots in traditional way of fermentation and sold in the local market in the name of "Soibum". After inoculation, the samples were kept in an incubator at 300± 20°C for a period of 60 days. Weekly interval analysis on the change in the level of total phytosterols was carried out during the fermentation by using Liebermann - Burchard reaction (Katayama et al, 1974).

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RESULTS AND DISCUSSION

While discussing the findings of this study, the results showed that the level of phytosterols is increased with the age at least up to 18 days (0.18% dry wt.) and afterwards it declined considerably upto 27 days as shown in table 1. The height at which the culm attains the height, the levels of phytosterols was found to be of 38.5 cm. and with the increase in height, the level of phytosterols is declined (0.18 to 0.03 % dry wt.) resulting in an increase of its fibre contents. With the increase of its fibre content there are declined in the level of phytosterols & vice-versa.

The scales which are unfit for vegetable purpose (Yamaguchi, 1983) contains a reasonable amount of phytosterols (Sarangthem and Srivastava, 1997). Hence the percentage of discarded scales was determined by using culms of different height. The result showed that the scales comprises nearly 44 to 48% of the total fresh weight of the culm and with the increase in height of the culm, the weight of scales is decreased slightly and simultaneously the delicate portion is decreased slightly as shown in table 2.

The concentration of phytosterols in fermented bamboo shoot of 6 days old showed a slight increase in its content (ranging from 0.09 to 0.23 % dry wt.) as compared to that of the fresh one (0.08 % dry wt.). The fermentation of 18 days old growth of succulent shoot showed an increasing trend of concentration of total phytosterols (0.18 to 0.6% dry wt.) from the initial stage of fermentation (0) up to 60 days as shown in table 3. However, no change was seen with the fermentation of 24 days old culm. The increase level of phytosterols in the fermented samples was due to anaerobic digestion by micro-organism that can cause degradation of the organic matter and resulted in the enrichment of phytosterols (Sarangthem and Srivastava, 1997).

Our findings indicate that the relationship of the phytosterols with the age and height of the culms and such a study would provide useful information regarding the extraction of phytosterols which may be used as a potent precursor for the synthesis of pharmaceutically active steroidal drugs including corticosteroids, anabolic steroids, oral contraceptives etc. in the future to meet the sudden drastic increase demand of the said drugs in the market at low cost.

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Table 1. Level of phytosterols in the succulent bamboo shoot at different stages of culm growth.

Period (days)	Height (cm)	Concentration of phytosterols (% dry wt.)
Initial	0	6.2
	5	17.5
	6	18.2
	8	20.2
	12	25.0
	14	29.5
	18	38.5
	22	47.8
	24	54.9
	25	59.4
	26	63.5
	27	65.4

* Standard error of the mean (n=3)

Table 2. Data showing the weight of scale and delicate shoot portion of the culms of different height in case of bambusa balcooa

Height of the shoot (cm)	Fresh weight of the succulent shoot with scale (culms) (g)	Fresh weight of delicate shoot without scales	Percentage of scale discarded
22	245	130	46.8 ± 0.32
25	575	300	47.8 ± 0.42
33	580	328	43.9 ± 0.37
37	550	300	45.5 ± 0.34
38	330	330	44.0 ± 0.22

Standard error of the mean (n=3)

Table 3. Change in the level of total phytosterols at different stages of fermentation in Bambusa Balcooa.

Age of the succulent Shoot-culm	Concentration of total phytosterols (%dry wt.)						
	Fermentation period (days)						
Days	0	7	14	21	28	35	60
6	0.08 ± 0.19*	0.09 ± 0.03	0.18 ± 0.02	0.23 ± 0.05	0.21 ± 0.04	0.18 ± 0.01	0.18 ± 0.02
18	0.18 ± 0.03	0.34 ± 0.003	0.35 ± 0.02	0.38 ± 0.01	0.4 ± 0.004	0.45 ± 0.05	0.6 ± 0.05
24	0.12 ± 0.03	0.13 ± 0.01	0.18 ± 0.02	0.17 ± 0.01	0.17 ± 0.01	0.17 ± 0.01	0.15 ± 0.03

* Standard error of the mean (n=3)