

Quantitative Estimation of Boswellic acids and Gymnemic acids in *Boswellia serrata* and *Gymnema sylvestre* extract

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Abstract: The present paper deals with the estimation of Boswellic acids and Gymnemic acids in *Boswellia serrata* & *Gymnema sylvestre* of therapeutic importance, which is an important medicinal plants. This study involves the quantitative determination of secondary metabolites. The amount of the Boswellic acid present in *Boswellia serrata* extract are reported (65%) and for Gymnemic acids in *Gymnema sylvestre* it is estimated as 27%. This data has provided the basis for its wide use as the therapeutic agent both in the traditional and folk medicines.

Key words: Gymnemic acids, Boswellic acids, Therapeutic, Quantitative.

Introduction

Extracts of *Boswellia serrata* gummy exudate have been traditionally used in the field of medicine as an antiarthritic, astringent, stimulant, expectorant, and antiseptic agent. *Boswellia* contains oils, terpenoids, sugars, and volatile oils. Up to 16 % of the resin is essential oil, the majority being alpha-thujene and p-cymene. Four pentacyclic triterpene acids are also present, with beta-boswellic acid being the major constituent. For inflammatory or asthmatic conditions, 300-400 mg of a standardized extract (containing 60% boswellic acids) three times daily is recommended.¹

Boswellia, or boswellic acids, exhibit potent anti-inflammatory properties, demonstrated both *in vitro* and *in vivo*. Triterpenes in boswellic acid reduce the synthesis of leukotrienes in intact neutrophils by inhibiting 5-lipoxygenase, the enzyme that is involved in the biosynthesis of leukotrienes, which mediate inflammation.²

On the other hand, *Gymnema sylvestre* is used for many conditions including diabetes, digestion, urinary tract problems, obesity, hypoglycemia, allergies, anemia, cholesterol and hyperactivity. The leaves are also noted for lowering serum cholesterol and triglycerides.³⁻⁵

Plant constituents include two resins (one soluble in alcohol), Gymnemic acids, tartaric acid, gurmarin, calcium oxalate, glucose, saponins, stigma sterol, quercitol, and the amino acid derivatives betaine, choline and trimethylamine. *Gymnema* leaves contain Gymnemic acid as an effective substance. Gymnemic acid has a structure with tri-terpenoid combined with glucuronic acid and several fatty acids.^{6,7} The presence of Gymnemic

acid (GA),(+) quercitol, lupeol, -Amyrin, stigmasterol etc., have been reported⁴⁰⁻⁴⁵. GA I, II, III and IV are anti sweet substance from the leaves of *G. sylvestre*.⁸

Plant material

Herbal extracts are obtained from Green chem herbal extracts & formulations, Bangalore.

Chemicals used

Methanol, Ethanol, Phenolphthalein ,Potassium permanganate, Sodium hydroxide ,Potassium hydroxide.

Estimation of Boswellic acids in *Boswellia serrata* by Titration method⁹

Total acids

weigh accurately about 0.2g of the sample and dissolve in 30ml of methanol by keeping in a sonicator for 5-10 minutes. Titrate against 0.01n sodium hydroxide using phenolphthalein as indicator. Perform a blank titration using methanol.

Calculation of Total acids [a]

$\text{Titre value} \times 0.00456 \times \text{normality of } 0.01\text{n NaOH} \times 100 \times 100$

$\text{Weight of the sample [g]} \times 0.01 \times (100 - \text{moisture content})$

Mineral acidity

Weigh about 0.2g of the sample and add 100ml of water. Heat the sample at 70 °c for 15 minutes in a water bath. Filter and collect the filtrate. Record the pH of the filtrate. Take care to wash the residue on the funnel. Collect the washings and filtrate in the conical flask and titrate it against 0.01N sodium hydroxide using phenolphthalein as indicator. Perform a blank titration using water.

Calculation of mineral acids [b]

$\text{Titre value} \times 0.00365 \times \text{normality of } 0.01\text{N Naoh} \times 100 \times 100$

$\text{Weight of the sample [g]} \times 0.01 \times (100 - \text{moisture content})$

This will give the mineral content [other than boswellic acids] of the sample.

Assay of boswellic acids = total acids [a] - mineral acids [b]

2) Estimation of Gymnemic acids in *Gymnema Sylvestre* extract by Gravimetry method¹⁰

Weigh accurately 3.0gm of Gymnema extract and dissolve it using 50ml of distilled water in a beaker. The dissolution is slow due to the product nature. Use a flat-tipped glass rod and beat the sample continuously to dissolve. It takes about 15min to dissolve the sample completely. If some insoluble portion remains, add 5% Potassium hydroxide solution in water and dissolve it completely. This step is very critical and hence ensures efficient trituration and maximum dissolution of Gymnemic acid.

Centrifuge the solution using a centrifuge and centrifuge tubes (4numbers). Avoid filtration which is slow and messy. Decant the clear supernatant solution in to a beaker. Adjust the pH to 1.4-1.6 using 10% Hydrochloric acid. Mix well and leave it at room temperature for about 30minutes.

Centrifuge the precipitate (Avoid filtration).Discard the clear supernatant solution and wash the precipitate with 20ml more water by poking the precipitate with a clean stick. Centrifuge again and discard the liquid.

Add a total volume of 20ml of Ethanol 95% minimum or Methanol 100% to the centrifuge tubes and dissolve the precipitate and dissolve by poking with a stick. Transfer the solutions to 2 numbers of centrifuge tubes and centrifuge again. Transfer the clear alcoholic solution to a beaker. Again add 10ml of ethanol and dissolve the residue. Centrifuge and transfer the solution into the same beaker. Evaporate the Ethanol on a water bath to residue.

Dry the residue at 60 to 65 °C to almost constant weight in a heating oven.

$$\text{Assay of Gymnemic acids} = \frac{\text{Residue weight} \times 100 \times 100}{\text{Sample weight (100-LOD)}}$$

Result & Discussion:

Boswellic acids are very potent inhibitors of the enzyme 5-LPO – and thus can suppress production of leukotrienes which act as cancer growth factors. Gymnemic acid possesses different pharmacological activities including suppression of taste sensitivity to sweetness, showed inhibition of intestinal glucose absorption and lower the plasma glucose level. In the present study boswellic acids from *Boswellia serrata* is estimated by titration method and determination of Gymnemic acids from *Gymnema sylvestre* is estimated by gravimetry method.

The results of Estimation are -

In *Boswellia serrata* - Boswellic acids content 65% (Titration method)

In *Gymnema sylvestre* - Gymnemic acids content 27% (Gravimetry method)

Conclusion

The estimation of boswellic acids and gymnemic acids by the titration and gravimetry method are described in the European Pharmacopoeia. The HPLC method requires a more sophisticated instrument, pure components as standards. This method is suitable for determination of mineral acids in *Boswellia serrata* especially for the herbal industries for a fair result and comparable to the titration and gravimetry method.

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