

PROJECT REPORT

ON

APPLICATION RESEARCH STUDIES ON SUGARCANE WAX

**Study II : Evaluating suitability of sugarcane
wax for human consumption**

Submitted to:

M/s Godavari Biorefineries Limited, Mumbai

Submitted By:

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Title : Application Research Studies on Sugarcane Wax
Study II : Evaluating Suitability of Sugarcane Wax for Human
Consumption

Duration : 6 months

Total Budget : Rs. 12 lacs

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Principal Investigator

1.0 Background : M/s Godavari Biorefineries, Mumbai is commercially producing sugarcane wax under the trade name “naturowax” and are interested in its application research in cosmetic and food industry. Sugarcane wax is derived from filter residue, the so-called press mud or filter cake mud obtained during the production of sugar from sugarcane. The sugar cane wax comprises of mainly alcohols and acids of long chain hydrocarbons.

M/s Godavari Biorefineries had approached Shriram Institute for :

- **Study I :** Evaluation of suitability of sugarcane wax for application in cosmetics
- **Study II :** Evaluating suitability of sugarcane wax for human consumption.
- **Study III:** Colour reduction of sugarcane wax

Out of the three studies, Study II has been completed and the results of the same are given in this report.

2.0 Scope of Work (Study II) :

- Procurement of sugarcane wax from M/s Godavari
- Literature survey on applications of sugarcane wax
- Profiling of sugarcane wax for heavy metal and pesticide content
- Toxicological evaluation of sugarcane wax for acute oral toxicity
- Compilation of results & submission of report

3.0 Literature Review

Sugarcane is one of the industrially important crops mainly grown in Brazil and India [1]. In India, sugarcane supports one of the largest agro-processing industries and millions of farmers are engaged in its cultivation [2].

Sugarcane wax is present as a whitish to dark yellow coating on sugarcane surface. It gets extracted during crushing of sugarcane and goes into press mud during sugarcane juice processing. The wax is extracted from the press mud by solvent extraction method.

Raw wax from sugarcane is a soft, dark coloured waxy solid comprising of 45% wax , 35% fatty matter and 20% resin and the fine wax fraction contains more than 55% by valuable ester; 8% of free acids; free alcohol 10%; 25% of aldehydes and ketones and 2% hydrocarbon [3,4].

Raw oil wax is used in to the preparation of animal feed and is used to obtain phytosterols and defoamer for the manufacture of fire extinguishers among other uses. Already refined wax emulsions can be used in coating fruits; floor polishes; paints and cosmetics; while the resin has more options for industrialization and is used in tires and plasticizer additive [5].

Nazato C. et al [6] have studied the use of sugarcane wax in lip gloss formulations with the objective of replacing synthetic wax.

In Cuba, sugarcane wax is produced on a large scale [7,8] and is used in several industrial applications.

Taylor A. K [9] has reported the potential uses of all parts of sugarcane plant. The filter mud removed from the raw cane juice is an important source of high value food grade wax. This wax is a potential replacement for a rain forest product, carnauba wax, which is widely used in cosmetics, food and pharmaceutical. In addition, by supercritical fluid extractions, wax can be a source of long chain aliphatic alcohols, like Octacosanol. Octacosanol is reported to increase physical stamina, remedy damaged nerve cells and stimulate sex hormones [10].

University Zhejiang [11] has also reported the extraction of phytosterol and wax from sugarcane peel. Wu Yonggang [12] has reported the use of sugarcane wax in preparation of regenerated polystyrene based flame-retardant material.

Scientists have reported the use of sugarcane wax in the area of cosmetics, paper coating, textile, fruit & vegetable coating, leather sizing, lubricant, adhesive, polishes and pharmaceutical industry [13, 14].

Scientists have reported that sugarcane wax can be an alternative to the costly carnauba wax, candellila wax and chitosan in the area of edible coatings [15-17].

Gnanaraj R.A. has presented a review on the pharmaceutical applications of D-003 acids, Policosanol and Octacosanol, which are derived from sugarcane wax [18].

4.0 Results Obtained

a) **Pesticide Content:** Carnegie A.J.M et.al have studied the pesticide residue in sugarcane. The pesticides mentioned in this publication along with other related pesticides were selected for analysis in sugarcane wax. The pesticide content of sugarcane wax was determined using chromatographic techniques; LCMS and GCMS.

The presence of following pesticides was studied using LCMS technique:

- i. Aldicarb
- ii. Atrazin
- iii. Ethion
- iv. Metribuzin
- v. Carbofuran
- vi. Primiphos-Methyl
- vii. Fenthion
- viii. Diazinon

The LCMS results revealed that the above mentioned pesticides could not be detected in sugarcane wax sample upto 0.01 ppm level.

The presence of following pesticides was studied using GCMS technique:

- i. Malathion
- ii. Lindane
- iii. Chlorothalonil
- iv. Methyl parathion
- v. Fenitrothion
- vi. Aldrin
- vii. o,p-DDE
- viii. Alpha-Endosulfan
- ix. p,p-DDE
- x. o,p'-DDD
- xi. Dieldrin
- xii. o,p'-DDT
- xiii. p,p'-DDT
- xiv. Endosulfan sulfate
- xv. Benzene hexachloride

Out of all these pesticides, only malathion was found to be present in sugarcane wax sample while the rest of the pesticides could not be detected in sugarcane wax sample upto 0.01 ppm level.

The GCMS results revealed that Malathion is present in the sugarcane wax sample to a level of 0.96 – 15.42 ppm. The results show that sample is not homogeneous.

The major possible sources of pesticide in sugarcane wax are:

- Spray of pesticide in sugarcane fields
- Residual pesticide in soil where sugarcane is being grown
- Water used for irrigation

b) Heavy Metal Content: The presence of heavy metals in sugarcane wax was determined by using ICP technique.

The presence of arsenic, cadmium, mercury, lead and tin was studied using ICP technique. The results obtained have been summarized in Table - 1.

Table – 1: Amount of various heavy metals present in sugarcane wax

S. No.	Heavy Metal	Amount (ppm)
1	Arsenic	0.082
2	Cadmium	Not Detected
3	Mercury	Not Detected
4	Lead	0.164
5	Tin	0.054

As such no protocol is available for quality criterion of sugarcane wax. The IS : 9875:1990 on Lipsticks states that as per the specification, maximum limit of arsenic in lipstick is 2 ppm and that of heavy metals as lead is 20 ppm. This means that the content of heavy metals found in sugarcane wax are within permissible limits.

c) Acute Oral Toxicity: The acute oral toxicity was performed in the toxicology centre at the institute as per the standard protocol. The results reveal that sugarcane wax sample is non-toxic. A copy of the report is attached as Annexure.

5.0 References

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ANNEXURE