High Value Grape Seed Oil

A technology for extraction of grape seed oil through optimized super critical fluid extraction (SFE) method produced grape seed oil (GSO) having high content of Vitamin-E and phenolic compounds. The oil recovery was 10-12 % of seed weight. Significantly higher levels of total vitamin E (gamma tocotrienol) and phenolic compounds especially resveratrol were found in SFE extracted GSO as compared to oil extracted through cold-press method. The anticipated bioactive potential was estimated through *in-vivo* animal studies to evaluate the radioprotective effect of GSO on the modulation of radiation induced intestinal injury.

Economics of the Technology

The economics of technology has been calculated based on the estimated cost for establishment of vineyard and recurring cost involvement per year per acre of grapes. The returns have been calculated based on yield of the produce from (A) Juice based technology and (B) Anthocyanin based technology. The cost of establishment of facilities for processing are not considered in these estimates

Cost

1. Initial cost of establishment of vineyard : ₹ 3.92 Lakhs/acre
2. Recurring cost : ₹ 2.40 Lakhs /acre /year
3. Total expenditure for 15 years productive life of vineyard : ₹ 39.92 Lakhs

Returns

A. Juice based technology

High value Manjari Medika juice = ₹ 12.6 Lakhs/acre (@ ₹ 150/L)
Enriched cookies = ₹ 9.6 Lakhs/acre (@ additional ₹ 50/kg)
Grape seed oil = ₹ 5.4 Lakhs/acre (@ ₹ 10000/L)
Total = ₹ 27.60 Lakhs/ acre

B. Anthocyanin based technology

Micro encapsulated anthocyanins = ₹ 60 Lakhs/acre (@ ₹ 10/capsule)
Enriched cookies from pomace = ₹ 9.6 Lakhs/acre (@ ₹ 50 additional/kg)
Grape seed oil = ₹ 5.4 Lakhs/acre (@ ₹ 10000/L)
Total = ₹ 75.00 Lakhs/acre

150 YEARS OF CELEBRATING THE MAHATMA

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Extension Folder No. 37

'Zero waste' processing technology for high value products from Manjari Medika: a grape variety of ICAR-NRCG

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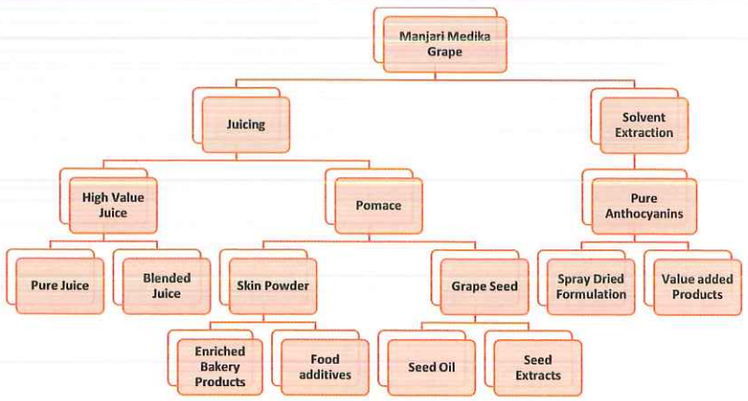
Manjari Medika: Grape Juice Variety

Manjari Medika variety is evolved at ICAR-NRCG from a cross between Pusa Navrang × Flame Seedless. It is a mid-maturing variety requiring about 130 days for harvesting under tropical growing conditions of Maharashtra and Karnataka. General cultivation practices followed to obtain quality grape are similer to Thompson Seedless. However, this variety dose not require PGR applictions for berry development. The variety is teinturier in nature and has attractive dark red colour skin and juice. The juice content in berries ranges from 68-74% with average recovery of 71% and hence suitable for juice making. The TSS content in juice is between 20 – 22 °B with acidity of 0.5-0.6 per cent thus the juice is naturally sweet. One kilogram grapes contain 5-6 g anthocyanins which is higher than that present in other commercial juice varieties. After initial promising results, the muli-locational varietal evaluation was initiated from 2007 and the variety was released by Institute Variety Release Committee in 2018 as Manjari Medika.

'Zero Waste' Processing Technology

Industrial processing of grapes for juice making generates large quantities of solid waste that consists of a mixture of grape skin and seeds known as grape pomace or grape marc. The grape pomace is a rich source of dietary fiber, anthocyanins and seed oil which have enormous commercial value. The Centre has developed processing technologies based on 'Zero Waste' concept. These technologies consist of i) high value juice making or anthocyanin extraction and encapsulation and ii) utilization of de-seeded pomace powder for making high quality bakery products (cookies and breads) and iii) seeds for extraction of high quality grape seed oil. Utilization of the pomace and seeds in development of high value food products and oil can substantially enhance the income of the industry as well as the farmers. Moreover, the consumers will get benefitted by access to food materials having high antioxidant properties.



Schematic Diagram for 'Zero Waste' Processing of Manjari Medika

Juice

The juice has high anthocyanins and polyphenolic content with high antioxidant activities. The anthocyanins content is 0.046 mg/mL and the polyphenolic content is 1.7 mg/mL. In most grape juice varieties, the colour pigments are present only in skin and absent in pulp/juice. Since skin is not damaged during juicing, the juice from such coloured varieties is colourless. But in case of Manjari Medika, grape flesh/juice also has high content of anthocyanins due to which the juice is of attractive dark red colour. Besides the nutritional and functional properties, the juice has higher level of acceptance based on sensory properties as compared to juice of other grape varieties. Due to higher medicinal values and sensory appeal, Manjari Medika juice is tagged as a health drink for fetching higher returns from health conscious consumers. Manjari Medika juice with its attractive colour and functional properties can be used for enriching juices of other grape varieties thorugh blending too.

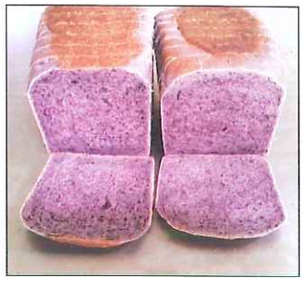
Uses of Pomace Powder

The pomace which is left over after juicing or after extraction of anthocyanins, is dried and skin and seeds are separated. The dried skin, which is rich in anthocyanins and phenolic compounds, is converted into fine powder. Technologies for enrichment of cookies and bread by adding pomace powder have been developed. The dried seeds are used for production of high value grape seed oil.

Enriched cookies

The enriched cookies are produced by replacement of 15% of the fine wheat flour (maida) by grape pomace powder. The addition of grape pomace powder increases antioxidant properties, total phenol, flavonoids, anthocyanin and dietary fiber giving various health benefits. Apart from enhancing nutraceutical properties, grape pomace powder imparts attractive brown colour and crunchiness to the cookies

Enriched bread



Breads prepared after replacing 5% of the fine wheat flour (maida) by pomace powder of Manjari Medika enhanced their dietary fiber content, nutritional and functional properties, besides providing a unique, attractive mauve colour. Enriched breads have high consumer acceptance and are found equally good for toasting and sandwich making

Micro Encapsulated Anthocyanin Powder

The Manjari Medika grapes are rich in phenolic compounds, especially anthocyanins. A technology for the extraction, isolation and purification of anthocyanins from Manjari Medika is developed. High anthocyanins yield of 5-6 g (dry, purified) /kg of grapes is obtained. High Resolution–LC/MS characterization revealed 12 different anthocyanins with malvidin-3-glucoside as the major anthocyanin. The extracted anthocyanins were spray dried and microencapsulated to prepare capsules. Collaborative study with CSIR-Indian Institute of Chemical Biology, Kolkata established the *in-vitro* and *in-vivo* anticancer activities of these anthocyanins against colon cancer. Combination of iC_{30} dosage of IR radiation and anthocyanin treatment resulted more than 50% cell death in human colorectal carcinoma cell suggesting radio sensitizing effect of anthocyanin and its relevance in cancer radio therapy.