

E- Technology Bulletin: 1



**Manjari Medika grape juice variety:
Suitable for Zero Waste Concept of Processing**



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Correct Citation: Sharma, Ajay Kumar, Shabeer, Ahammed TP and Banerjee, Kaushik 2019.
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E-Technical Bulletin No.: 1

Published by:

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ICAR-National Research Centre for Grapes,

Pune-412307

Industrial processing of grapes generates large quantities of solid residues that consist of a mixture of grape skins and seed namely grape pomace or grape marc, and stems or stalks. These by-products, which are commonly discarded, are an important source of dietary fiber and phenolic compounds, with antimicrobial and antioxidant properties. Wine and juice industries generate various wastes but pomace (skin and seeds) and lees has enormous values. Usually these wastes are not utilized properly just burnt or destroyed in the open fields. It is found that these wastes have immense value. Utilization of these wastes in food products and development of new high value products not only save soil and water from pollution, but sustain this industry by earning from utilization. The consumers will get food materials having high antioxidant properties.

Manajri Medika: Grape Variety

Manjari Medika variety is evolved after crossing between Pusa Navrang X Flame Seedless. The work on this variety was initiated by ICAR-National Research Centre for Grapes during 2007. The variety is belongs to teinturier category of grape varieties. The juice content in berries is found between 68-74% with average recovery of 71%. This variety is found suitable for juice making. TSS content in juice is recorded 19 to 22 °Brix with acidity of 0.5-0.6 per cent. Due to its teinturier nature, juice of this variety is very dark in colour and contains anthocyanins. One kg grapes contains 4-6 mg anthocyanins which shows richness of anthocyanins in berries of Manjari Medika. It requires 130 days from pruning and belongs to mid maturity period. Manjari Medika variety is released during 2018 by ICAR-National Research Centre for Grapes, Pune (India).

Zero Waste concept:

The conservation of all resources by means of responsible production, consumption, reuse, and recovery of all products, packaging, and materials, without burning them, and without discharges to land, water, or air that threaten the environment or human health is known as Zero Waste Concept. This Zero Waste concept based technologies have been developed for juicing, utilization of pomace in making high quality bakery products (cookies and breads) and remaining seeds for extraction of high quality grape seed oil. Details on utilization of Manari Medika grapes is presented in Fig. 1.

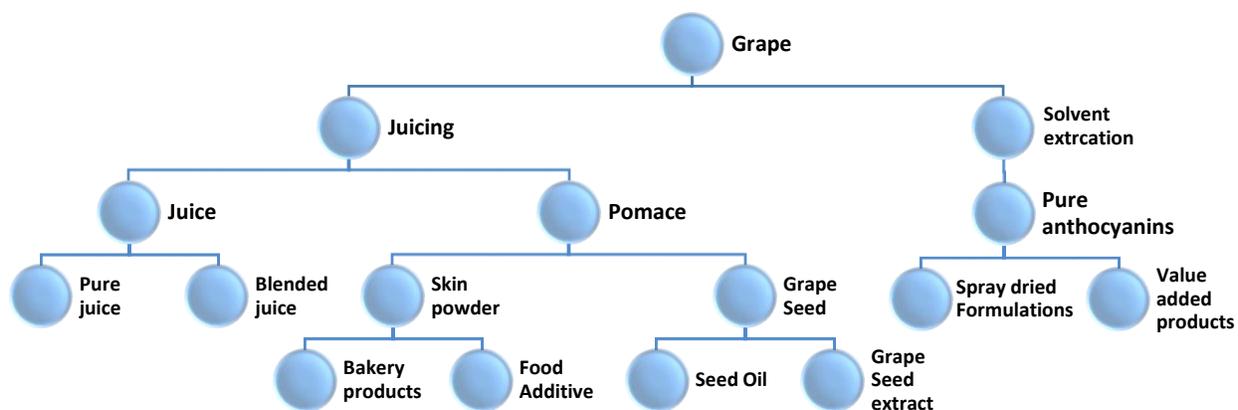


Fig. 1: Utilization of Manjari Medika grapes under zero waste concept

Juice: A juice recovery of more than 70% is recorded in this variety. TSS content in the juice is achieved more than 20 °B easily. The juice is very dark in colour and found with higher anthocyanins and polyphenolic content. Due to higher anthocyanins and phenolic content, higher antioxidant activities were recorded in the juice of Manjari Medika. Generally, grape juice is white/colourless and skin contains colouring agents i.e. anthocyanins. During juicing skin is not damaged so coloured grape varieties give white juice only. But in case of Manjari Medika, grape flesh/juice has higher content of anthocyanins and juice is registered with dark red colour. Beside the nutritional and functional properties, the juice has higher level of level of acceptance based on sensory properties.

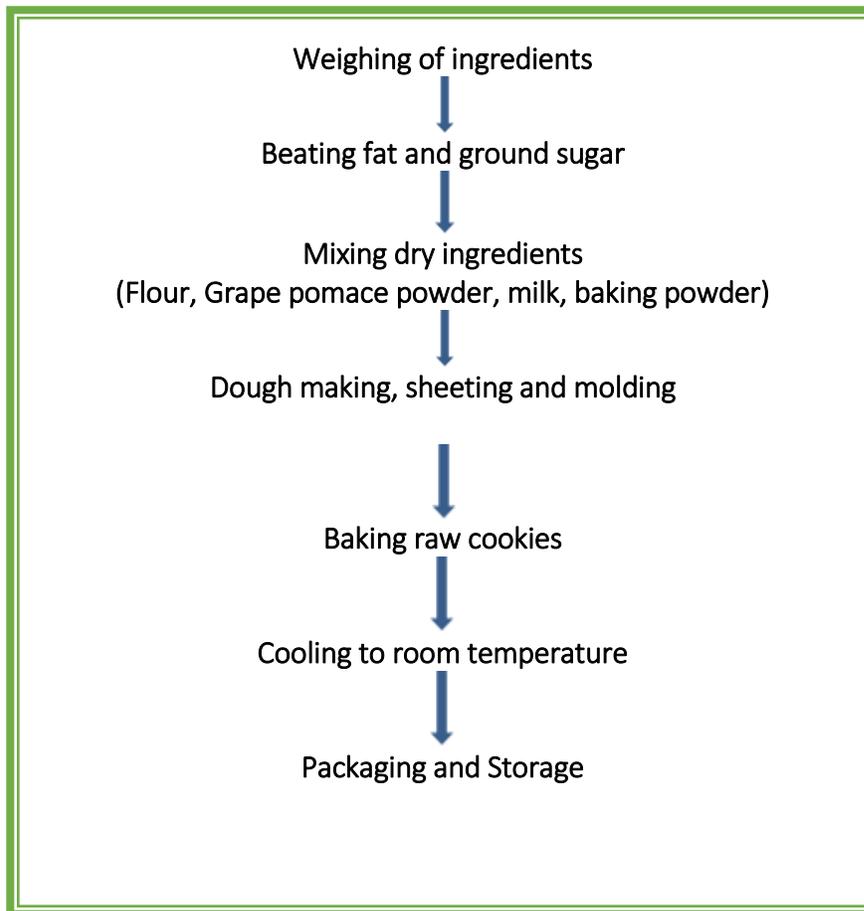


Dark red colour of juice has quality of attracting consumers with good appeal. Tag of higher medicinal values is capable to popularize among health conscious consumers who can pay high price also.

For blending: The colour of juice attracts consumers and gives more acceptability. As Manjari Medika juice is very rich in colour it can use for enriching and giving the colour to juice of other grape varieties also. The blending with Manjari Medika will not only give attractiveness to other varietal juices, it will enrich these grape juices due to loading of functional properties.

Uses of pomace powder: Pomace which is left over after juicing Manjari Medika grapes is dried and skin and seeds separated. The dried skin is converted into powdery form. The skin is not damaged during juice preparation so whole anthocyanins remain with skin only. Pomace powder of Manjari Medika is recorded with higher anthocyanins, phenols, tannins, proteins and fibers and technologies have been developed to utilize in producing cookies and breads. An oil recovery of 8-10% is noted in seeds of this variety. The technologies developed based on Manjari Medika pomace powder and seeds are mentioned here.

Enriched cookies:



The Cookies can be enriched by replacement of fine wheat flour by addition of grape pomace powder. Grape pomace powder is added to dry ingredients. The addition of grape pomace powder increases antioxidant properties comprising ferric reducing antioxidant power, total phenol content, flavonoid and anthocyanin. Grape pomace powder imparts brown colour to cookies



as compared to control. A total of 15% maida has been replaced in these cookies. The cookies are found colorful appearance with higher nutritional, functional and sensory properties.

Breads:



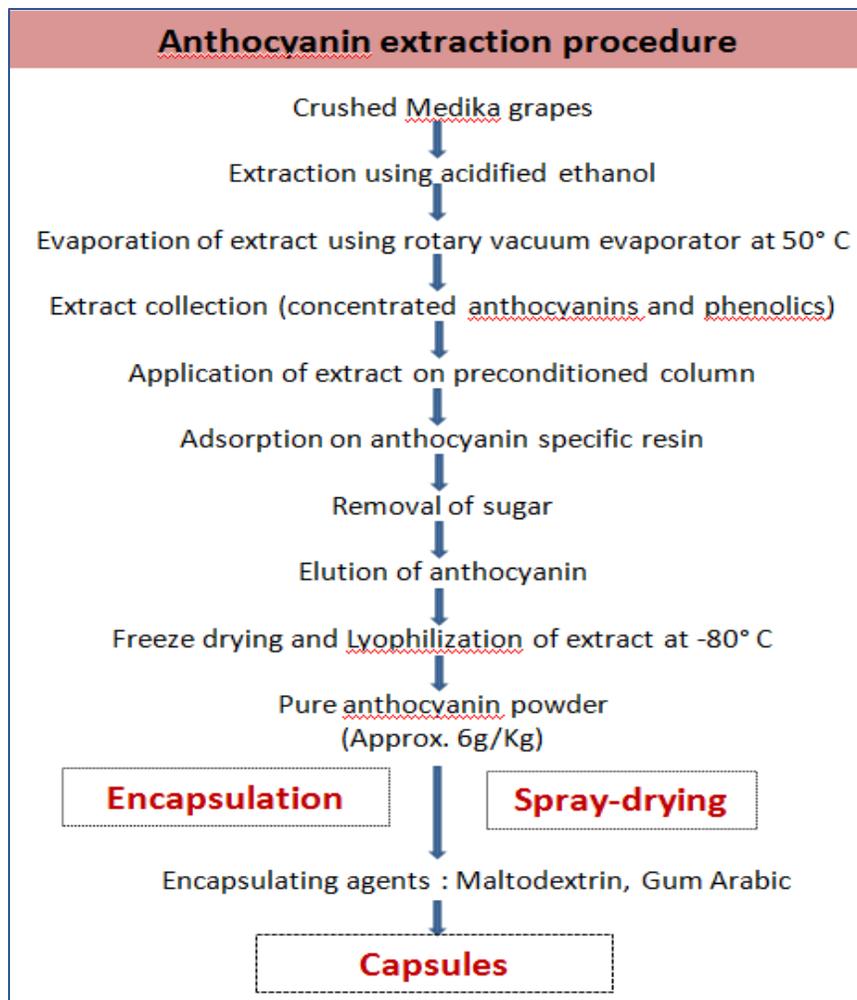
A technology on enrichment of breads by adding pomace powder has been developed. Breads prepared after replacing maida by pomace powder of Manjari Medika are very attractive in colour. Beside improved colour, these breads having higher nutritional and functional properties also. The pomace powder contain fibers so breads having fibers also. These breads contain fibers.

Prepared breads are well accepted in sensory evaluation. Enriched breads are found equally good for toasting and sandwich making.

Rich source of phenolic compounds:

Phenolic compounds are group of phytochemicals that play a crucial role in the nutritional and sensory properties of grape and wine. Phenolic compounds can be classified into two major groups: non-flavonoid viz. hydroxybenzoic acids, hydroxycinnamic acids and stilbenes and flavonoid compound viz. anthocyanins, flavan-3-ols and flavonols. The reported literature suggests the involvement of phenolic compounds in many positive health benefits such as protective effects

against certain diseases like cancer and cardiovascular diseases, diabetes mellitus, atherosclerosis and dermal disorders or inflammation etc.



The Manjari Medika grapes found to be rich in phenolic compounds, especially anthocyanins. ICAR-NRCG developed a technology for the extraction, isolation and purification of anthocyanins from Manjari Medika. Our in house study estimation revealed a comparatively higher anthocyanins yield of 5-6 g (dry, purified) anthocyanins/Kg of grapes. These anthocyanins composition was characterized by High Resolution–LC/MS. Further, extracted anthocyanins was formulated to microencapsulated capsules (20%) through spray drying technology. Our 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 IC₃₀ dosage of IR radiation and anthocyanin treatment resulted more than 50% cell death in human

colorectal carcinoma cell suggesting radio sensitizing effect of anthocyanin indicating relevant for the treatment of cancer radio therapy.

Economics of technology: The economics of technology has been calculated based on estimated cost of pilot plant establishment and recurring cost involvement per year per acre of grapes. The returns have been calculated one acre of Manjari Medika grapes.

Establishment cost (` in Lakhs) of pilot plant:

Item	Cost
Extraction Unit	20.0
Spray Dryer	16.0
Vacuum Concentrator	10.0
Consumables and other expenses	50.0
Building (600 sq ft)	10.0
Capsule filling machine	5.0
Total	111.0

Return: Calculated for one Acre of Manjari Medika Grapes

Yield of grapes: 12 T

Yield of anthocyanins per kg grapes: 5 g

Anthocyanins yield from one acre of Manjari Medika: 60 kg

Total capsules (50 mg anthocyanins/ capsule): 12 lakhs/ acre of grapes

If capsule sold @ Rs 5/ capsule then total return: 60 lakhs/ Year/Acre of Manjari Medika

High value grape seed oil (GSO) from Manjari Medika:



Manjari Medika is being developed as a juice variety. Juice industry produces huge quantity of pomace having considerable amount of grape seeds. ICAR-NRCG optimized a technology for extraction of phenolic compound and Vitamin-E enriched grape seed oil from Manjari Medika seeds through super critical fluid extraction. Based on our initial investigation of the phytochemical profile of Manjari Medika

grape seeds by GC-MS and LC-MS, we shortlisted the bioactive compounds with high antioxidant and health-benefit potential. The conditions are further optimised for extraction of oil from seeds by supercritical fluid extraction (SFE) so as to maximise the extraction of such beneficial bioactive compounds in oil. Significantly higher levels of total vitamin E, gamma tocotrienol and phenolic compounds especially resveratrol were found in SFE extracted GSO as compared to cold-pressed oil. The anticipated bioactive potential was estimated through *in-vivo* animal studies to evaluate the radioprotective effect of GSO on the modulation of IR-induced intestinal injury.

How ICAR-NRCG can help the entrepreneur?

- ICAR-NRCG will coordinate with entrepreneur for making arrangements for contract farming with growers for this specific variety
- ICAR-NRCG will provide genuine planting material of the particular variety.

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