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Editorial

Value Addition and Product Development of Fruits through Intervention of Vacuum Freeze-drying Technology: An Industrial Prospect for Wild Edibles in Uttarakhand

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India Himalayan Region is well recognized for its rich biotic wealth and cultural and ethnic diversity. Availability of more than 650 species of wild edible plants largely supports to the local communities to meet their nutritional needs as food supplements. Unfortunately, the high potential of these natural resources to combat with global malnutrition issues has been under exploited and underutilized. In case of cultivated plants, the standard practices pertaining to growing, harvesting, post-harvesting, processing technology, packaging and storage of the processed products are well known to develop quality products. On the other hand for wild edibles, only the measures for handling during the collection and post-harvest activities apply and this, it is one of the major advantages of the wild fruits particularly collected from non-polluted environment of Himalayan region.

Though, value addition and product development work have been carried out for the fruits of some wild edible species and the same has resulted in providing alternate source of livelihood to the rural people, still value addition related issues for majority of promising species are not addressed effectively till date. Major constraints in processing and value addition addressed in the past reports were lack of proper technology to develop quality products of international standards. Particularly due to lack of effective drying and preservation technologies for well-known wild edible fruits in the form of Berries (Seabuckthron, Prunus, Amla, Rosehips, Kafal, Rubus, Berbaris, etc.), Figs (Timla, Bedu, Khaina, etc.), fruits (Bhamora, Melu, Apricot, etc.) and flowers (Rhododendron, Rose), value added products having substandard quality preservatives, sugar, colour and essence are widely available in the regional market.

Freeze-drying is a very gentle dehydration process used for preservation of high-quality foods. Vacuum freeze-drying of biological materials is one of the best methods of water removal, with final products of highest quality. It is well known fact that the solid state of water during freeze-drying not only protects the primary structure and the shape of the products but also results into minimal volume reduction. The freezing temperature in the process allow maximal nutrient and bioactive compound retention. This freeze-drying technology has been found very successful for the diverse biological materials like meats, coffee, juices, dairy products, cells, and bacteria. It has already been practiced for blood plasma, hormones, penicillin and vitamin preparations.

A dehydrated product requires four to ten times more energy than regular hot air drying but due to excellent outputs, freeze-drying technology has always been recognized for high value products with excellent quality. Its application for plant-based foods has been traditionally dedicated to the production of military or extreme-sport foodstuffs, space shuttle goods and specialty foods with high consumption value. The market for Naturally developed and Organically certified products is, however, strongly growing as well as the consumer's demand for foods with minimal processing and high quality. This is the reason that the market for freeze-dried plant-based foods is not only increasing but also diversifying worldwide. The demand of freeze-dried fruits and vegetables chunks, pieces, or slices are nowadays increasing rapidly. Freeze-dried tea, coffee, or syrup enriched with polyphenol concentrated extracts from fruits are used to make instant drinks. Wide range of food products such as confectionaries, morning cereals, soups, bakeries, meal boxes, etc.

are being prepared using this technology. This technology has been limitless especially for the idea of value addition and development of new products from the prioritized wild edible plants using latest processing technologies have never been adopted by local entrepreneurs and existing processing units.

Apart from standardized process related to harvesting, collection, transportation, semi-processing and storage, the application this technology for value addition and product development in major wild fruits available in Uttarakhand has been proposed in this concept note. Out of the great diversity of wild edibles, intervention of this latest technology initially for wild *Rosehip*, *Seabuckthorn*, *Rhododendron*, *Rubus sp*., *Berbaris*, *wild Apricot* and *wild Amla* to the local progressive entrepreneurs for developing various value-added products like Herbal Teas, Instant energy drinks (dehydrated powders) & Bars, Concentrates, Granules, Confectionaries, Dried-fruits, etc. could be done at priority. Production of all these quality products will not only contribute in income generation and resource augmentation but also meet global market demand.

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