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Development of Low Cost Eco-friendly 'Holi' Powder

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***Abstract* – 'Holi', the festival of colour is celebrated all over India. During this festival a good quantity of synthetic 'holi' powder is used every year, which contain heavy metals, sand and soil. Considering the threat of heavy metals to the environment and human health, a simple, low cost method of making eco-friendly 'holi' powder has been standardized.**

Tapioca (*Manihot esculanta*) is a high yielding annual crop requiring low agronomic input and it is harvested well before 'holi'. The process involves the use of tapioca flour and Fruit Products Order, 1955 approved synthetic food colour which does not contain heavy metals. The 'holi' powder contains maximum 0.365% active ingredient. The product is found to be acceptable based on colour brightness, texture and stickiness, low cost involvement and simplicity of procedure. The four different colours of "holi' powder were developed which were also stored well at dark and room temperature.

***Keywords* – 'Holi', Tapioca, Flour, Eco-Friendly, Food Colour.**

I. INTRODUCTION

Although the demand for herbal 'holi' powder has gone up in recent times, synthetic dye-based 'holi' powder, are generally available in the market due to the cheaper raw material, popular demand and easy method of preparation. The sale of 'holi' powder, continues to grow every year with 10-15 per cent annual growth (Rawat, 2008).

The synthetic dye-based 'holi' powder can cause dermatitis, respiratory problems and allergies. Prolonged application can even cause cancer. Those synthetic 'holi' powder which are based on sand and soil are mostly harmful for skin. Majority of coloring agents used in 'holi' are synthetic dyes of non-food commodities such as textile, paper and leather. Most of the synthetic dye-based 'holi' powder contain heavy metals. Scientific tests have verified that these can cause skin abrasions, skin and eye irritation, allergy and can even trigger asthma (Rawat, 2008, Sharma and Saxena, 2013 and Sharma, 2013).

A few work on safe 'holi powder' production on commercial scale has been reported. National Botanical Research Institute (NBRI), Lucknow, India has already developed herbal 'gulal' and has transferred its technology for commercial production (www.nbri.res.in). However, there still exists need for development of low cost, simple but safe 'holi powder' using easily available safe material.

II. MATERIALS AND METHOD

The Fruit Products Order (FPO), 1955 approved food colors, produced by VESCO products Co, Kolkata: 23, India, which are being utilized for the present study are described at Table 1.

Raw tubers of tapioca known as "Balijan", a local collection of Assam, was collected from the Horticultural Orchard, Assam Agricultural University, Jorhat. Dry tapioca chips and flour were made from raw tapioca tubers following standard method (Das *et al*., 2008).

Aqueous solution of food color (green) of five different concentrations (0.2%, 1%, 5%, 7.5% and 10%, respectively) were prepared. To each of the solution, tapioca flour of 10% moisture content (wet basis) was mixed uniformly in the ratio 1:1 (w/v) and a dough was made by manual kneading. This dough is manually spread with thickness of about 1 cm over plastic sheet and exposed to sun drying till the moisture content reached less than 10% (wet basis). The dried material was milled in a hammer mill and sieved through 250 micron sieve to get the 'holi' powder. The 'holi' powder of five different shades were scored for brightness of color, acceptable as 'holi' powder based on visual appearance.

On the basis of the highest score for brightness of the five shades of green color, the 'holi' powder containing 10% dye or 0.367% active ingredient was selected for further preparation of 'holi' powder of four different colors (green, red, orange and chocolate), following the method described above. The 'holi' powder was stored air tight inside food grade plastic containers, at room temperature (average 30^0C) and at dark for six months. These products were analyzed for sensory qualities, particularly on color brightness, texture, stickiness of the powder to skin and overall acceptability using nine point Hedonic scale, just after making and after six months of storage.

III. RESULTS AND DISCUSSION

From fresh tapioca tubers, 29.35 % dry chips (having 10% moisture on wet basis) were obtained, which on further milling, coloring, drying and grinding produced 26.67% final product ('holi' powder) .

The 'holi' powder of dye concentration 0.2% to 10% are shown in Fig. 1. It was observed that the brightness of color for 'holi' powder having 5%, 7.5% and 10% dye content would be more acceptable, as bright color is having more consumer preference. The rest (0.2% and 1%) would not have consumer demand due to lack of brightness.

The 'holi powder' of 10% dye concentration of four different colors are shown in Fig. 2. Sensory evaluation (Table 2) revealed the highest preference for green colour, followed by orange and red and then chocolate. Stickiness to skin scored average 7.5 points out of 9. There was good acceptance of texture for all four different powders.

Quality of the color during storage (six months) at room temperature at dark in closed plastic containers revealed that no change in above mentioned quality between just after making and six months after making (Fig. 3).

From the present study, it has been observed that tapioca flour can be used as base material for 'holi' powder making, instead of sand or soil which are presently used in

commercial products. As tapioca is a low agronomic input requiring crop, it can be a better substitute for costly starch extracted from corn or other cereals, which are presently used in some costly herbal 'holi' powder. The higher starch content on dry wt basis (94.5%), of the flour obtained from "Balijan" tubers (Das *et al*, 2008), might have helped the food color to be uniformly distributed within the base material. Though, for any fruit product, used for human consumption, the dye should not exceed 0.2g per kg of the final product (Srivastava and Kumar, 2003) , in the present study, considering consumer acceptability for the brightness of the 'holi' powder which is a not a food item, the dye was mixed at higher level (10%). However, lack of heavy metals and water solubility of the FPO approved colors, are thought to be better qualities for protecting the human health and environment and reducing the water (which is a scarce item) requirement for cleaning.

IV. Conclusion and Recommendation

There is scope for commercial production of 'holi' powder using tapioca flour and FPO approved food colour.

Acknowledgment

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Table 1 : Description of the FPO approved food color used for 'holi' powder making.

S.No.	Colour	Common Name of the Components	Color Index	Chemical Class [5]
1	Green	Tartrazine Brilliant blue FCF	19140 42090	Pyrazolone Tri phenyl methane
2	Orange	Carmoisine Sun set yellow FCF	14720 15985	Azo Azo
3	Red	Carmoisine	14720	Azo
4	Chocolate brown	Carmoisine Sun set yellow FCF Brilliant blue FCF	14720 15985 42090	Azo Azo Tri phenyl methane

Fig. 1 :'Holi' powder of green color of five different shades (dye added at 0.2%, 1%, 5%, 7.5% and 10%, respectively from left to right)

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Fig.2. 'Holi' powder of four different colors (dye added at 10%)

Table 2: Sensory evaluation of 'holi' powder having 10% dye

Sensory quality	Green Color	Red Color	Orange Color	Chocolate Color
Brightness of color	8.0	7.5	7.5	7.0
Texture	7.5	7.5	7.5	7.5
Stickiness to skin	7.5	7.5	7.5	7.5
Overall acceptability	8.0	7.5	7.5	7.0

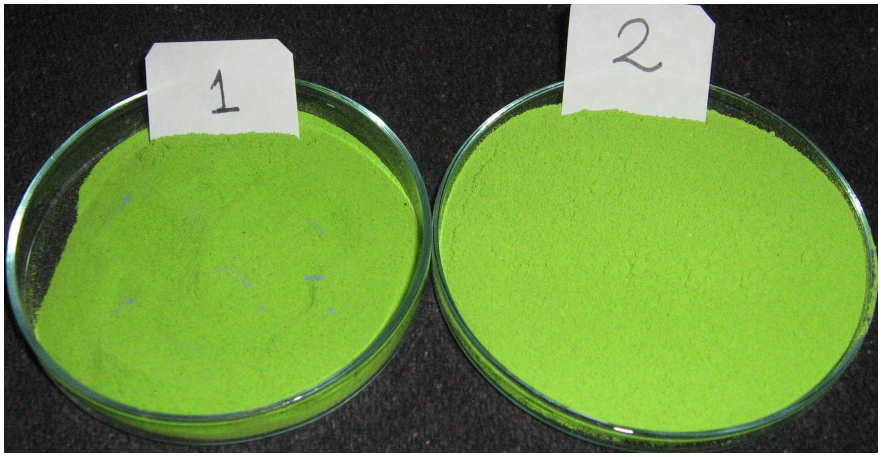

Fig.3. "Holi" powder just after making (1) and six months after storage at room temperature, at dark (2)