Extraction of Eco-Friendly Color production

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Abstract: Every necessity comes with a price. Being at the peak of development, it's impossible to banish the currently developed methods to eradicate the issues. All we can do is to find some alternate method without damaging environment. So to ensure the sustainability, we need to find a green method to merge the nature with the technology. Color being an essential part of our life. Colors are also becoming integral part of modern day life. Use of colors are becoming a part of our everyday life. Many synthetic colors formed from chemicals have adverse effects on environment. There is need of nontoxic colors in order to remove substances like lead, cadmium, chromium and cobalt entering in the food chain. The Holi is the festival for colors are celebrated all over India. During this festival synthetic holi powder can be used which contain toxic heavy metals and soil. Holi colors are traditionally particle powders or fluid splashes sprayed by hand, toy guns, or slamming balloons, and are sourced from natural sources. However, high performance liquid chromatography has recently revealed that these colors are polluted with harmful substances like malachite green, rhodamine and gentian violet. Considering the threat of toxicity to environment and public health, an eco-friendly method of making holi powder has been reported here. The product which we prepared were found to be acceptable based on color brightness, texture and stickiness, low cost involvement and simplicity of procedure. The four different colors of holi powder were developed which were also stored well at dark and room temperature. Considering the environmental friendly method as the base for color production we can introduce a sustainable method for its production. In this paper we tried to find nature friendly method to produce different colors including the dry and wet one. One can follow this method to create colors with limited raw materials which are also environmental friendly in nature. With the aid of technology these nature based colors can be built in to a productive commercial industry. Biocolours are nowadays used in holi festival. Biocolours are mainly prepared from plant origins. This paper is open for further research & can lead to different branch of new innovative method to replace the present harmful extraction one.

Keywords: Synthetic colours, harmful effects, natural colours, environment, holi festival.

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. 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. A few work on safe 'holi powder' production on commercial scale has been reported. National Botanical Research Institute, Lucknow, India has already developed herbal 'gulal' and has transferred its technology for commercial production. However, there still exists need for development of low cost, simple but safe 'holi powder' using easily available safe material. Colors bring joy & happiness to our life. These are the synonym of liveliness. But this liveliness doesn't take much time in conversion to termination, when not taken care of its chemistry thatits molecular composition. Living in a vibrant country like India full of culture & heritage, it's difficult for one to stay away from colors. But the ill effects of manufactured & commerciallysold colors are a bit of concern now-a-days. A lot of diseases emerging from these colors including numerous allergies are creating hindrance to the health. So, alternation is the only solution to be implemented. Nature is the befitting alternation of every toxicity used for mankind. Initiating from the domestic usage to the commercial usage, if treated with few techniques the colors extracted from a mere plant part can be successfully established as industry even as a commercial one.

The development of natural colors took place in about 5000 BC. In India, the use of natural dyes for dying, painting and printing in the prehistoric periods Ajanta paintings, dated as far back as first century, were painted with natural colors. Sven rinman, a swedish chemist, discovered this compound in 1780, green chrome oxide was in new synthetic green created by chemist named Pennetier in Paris in 1835, emerald green was a synthetic deep green made in the 19th century by hydrating chrome oxide. Colors are also becoming integral part of modern day life. Human life is full of different colors[1-4]. Also colors which are used for many applications need to be environment friendly**.** Color has aesthetic, religious and psychologica**l** importance in our life. Festivals like hol**i** are colorful cultural celebrations. The color obtained from synthetic chemical formulation is harmful and can adversely affect our skin and on environment. The holi powder contains crops, sand and soil. They found that the product obtained from this raw material was acceptable based on color brightness, texture and stickiness. These natural colors didn't contain any type of a harmful chemicals. so it was good for us while celebrating holi festival.

Use of Eco-friendly colours :

- It was made with the natural things, like vegetables, fruits and flowers.
- Use of eco-friendly colors in suits that do not harm skin.
- It won't harm to the eyes.
- The eco-friendly colors are safe for playing.
- The colors normally used during Holi are chemical based and can cause harm. The use of synthetic colors can not only harm your skin, eyes, hair, etc;

The difference between natural and herbal colours:

The herbal and organic colours are almost the same terms, herbal colours is extracted from the roots, leaves and stems of herbal plants, whereas organic colours is nothing but herbs obtained by organic farming both come under natural Holi colours.

Some of the natural colours that are easily available given below.

Mehndipowder -- Greencolour
Turmeric powder -- yellowcolour
Redsandalwood -- red colour
Jacaranda flowers -- bluecolour

The above mentioned natural colours are not only safe but also enhance the appearance of skin, they have antibacterial and antiseptic properties, let us try to use this and make the Holi a happy and safe natural celebration.

Some of the synthetic chemicals and their harmful effects:

- Green colour: is obtained from copper sulphate ($CuSO_4$) it may cause allergies in eyes, irritation in skin or temporaryhardness.
- Purple colour: is obtained from chromium iodide (CrI_3) it may cause bounchial asthma other respiratoryinfections.
- Silver colour: it obtained from aluminium bromide ($AlBr_3$) it may cause skin cancer as it is carcinogenic innature.
- Black colour: it obtained from lead oxide (PbO) it may cause renal failure or learning disability.
- Red colour: is obtained from mercury sulphide (HgS) it may cause skin cancer, mental retardation, paralysis or impaired vision.

Table 1. Natural and artificial Color

Natural colours	Artificial colours
obtained from natural source like extraction.	Obtained by the chemical reactions.
processed by physical means.	relatively stable(in most cases).
May be less costly to use.	expensive
no health concerns. benefits to health.	health effects like Allergic and skin cancer.

Synthetic colors are easily obtained from imported materials, but the price is relatively higher, the use of synthetic colors is very dangerous for the environment because it is contained carcinogens material that was suspected can lead to skin allergies and skin cancer. Synthetic

color give an easier way in coloring. Because the process is faster than natural method. But it has a negative effect to the environment. Soil and water will get polluted by this material because it's hard to degraded by the nature. As the result, the color of the river became so colorful just like the rainbow and it pollute the river and gave negative effect to the aquatic ecosystem.

The artificial colorants used nowadays can induce attention deficit disorder, inhibition of the immune system, hyperactive and allergic reactions. Prolonged use of chemical food colors can also induce hyper acidity, thyroid tumor, dermatitis, asthma, nasal congestion, allergies, abnormal pain, nausea, eczema, liver, kidney damage and cancer. Still people are unaware of the facts that many manufacturer uses toxic metals as filler in the artificial colorants.So, there's an immediate need of switch to natural and safe as much as possible.

Materials and Methodology

Mortar & pestle was used in crushing the raw materials for making the wet & dry colorsHot plate and Bunsen burner were used in making of dry colors and wet colors respectively. Hot plate was used throughout the making of dry colors, it helps to vaporize the remaining moisture contain giving it a fine powdery structure. Bunsen burner was used as an external heat provider to contrite the made pigment solutioneventually producing a thick solution whose effect stays long. All the colors were made by using plant pigment as the raw materials. Corn starch / Refined flour / Turmeric was used as a filler. A few colors were made by using food colours (Manufacture by plant pigment such as Lycopene, Xanthophyll, Carotenoids, Anthocyanins, Flavonoids)

Dry colors

1. Pink color

First, 20-30 flowers of Bougainvillea were crushed using mortar and pestle. Next, a thick slurry was made out of it without leaving any reaming solid particles. Then the prepared Slurry was filtered out and 6-8 drops of it was mixed with 4-5 gram of corn starch. Finally, it was heated over a hotplate for 15-20 minutes at medium range to vaporize the moisture present in it.

2. Green color

First, 40-50 leaves of Neem Plant were Crushed using mortar and pestle. Next a thick Slurry was made out of it without leaving any reaming solid particles. Then, the prepared slurry was filtered out and 6-8 drops of it was mixed with 4-5gram of Corn starch. Finally, it was heated over a hotplate for 15-20 minutes at medium range to vaporize the moisture present in it.

3. Yellow color

First, 20-30 flowers of elder trumpet were Crushed using mortar and pestle Next a thick Slurry was made out of it without leaving any reaming solid particles. Then the prepared Slurry was filtered out and 6-8 drops of it was mixed with 4-5 gram of Corn starch. Finally, it was heated over a hotplate for 15-20 minutes at medium range to Vaporize the moisture present in it.

4. Wine color

First, half of a beetroot was cut into thin slices and were crushed, little amount of H20 was added. Next. a thick Slurry was made out of it without leaving any reaming solid particles. Then, the prepared Slurry was filtered out and 6-8 drops of it was mixed with 4-5 gram of refined flour. Finally, it was heated over a hotplate for 15-20 minutes at medium range to Vaporize the moisture present in it.

Wet colors

The colors made were diluted in nature. So, to increase its permanence, a little amount of cornstarch was added to it. This mix-up resulted in binding the filler to the pigment particle and converting itself into a thick slurry. The dry colors were lighter than the wet color with respect to same shades as wet colors were directly involved with pigment extraction method.

1. Yellow color

First, 4ml of water was taken and 4-5 drop of yellow food colour was added to it. Then, two spoons [spatula] of turmeric was added to the liquid. After it, again 4-5 spoons [spatula] of corn starch was added to the solution. Finally, the Solution was boiled over a Bunsen-burner around 10 minutes to concentrate it.

2. Green color

First, 4ml of water was taken and 4-5 drop of Green Food Colour was added to it. Then two Spoons [spatula] of dry green colour made earlier were added to the liquid. After it again 4-5 spoons [spatula] of Corn starch was added to the solution. Finally, the solution was boiled overa Bunsen burner around 10 minutes to Concentrate it.

3. Red color

First, 4ml of water was taken and 4-5 drop of red food Colour was added to it. After it, again 4-5 Spoon [spatula] of Corn starch was added to the solution. Finally, the solution was boiled over a Bunsen burner around 10 minutes to Concentrate it.

4. Wine color

First, a half of beetroot was cut into thin slices and was crushed into thick slurry. (Little amount of water was added to it). Next, the Slurry was filtered out into a beaker using] Filter paper. Then, five to six spoons [spatula] of Corn starch was added with 3ml of the filtered Slurry and Stirred neatly. Finally, the Solution made, was boiled over a Bunsen burner around 10 minutes to concentrate it.

Analysis

The colors made without chemicals were almost identical to the ones manufactured on the market. Measured pigment complementary to the amount of filler constituted various shades. Apart from being safe and free from toxic elements, they need a few modifications to compensate for their drawbacks.

- As they are plant-based products, they can't be preserved for too long. After a while, they get destroyed, they need to be processed with a few additives to increase their longevity. Even almond oil can be used to preserve it for long, as they rancidify at the slowest pace.
- Being made from all plant constitutes, they have a natural odor, which can be allergic to few. Specifically, people diagnosed with asthma should be cautious while using these colors. To neutralize the odor, essential oils can be used, but people having hypersensitive immune system need to be cautious about these too.
- To manufacture it in a commercial range, a few things need to be considered such as consistency, raw material innovations in production such as varieties of color manufactured today i.e. neon colors, glitter colors, paste etc.

- The concept of extracting colors in an eco-friendly manner can be researched further to establish it into a productive model. As long as it can be made commercially productive, it would be substantial in use.
- It was analyzed that after a while leaving the solution (wet colors) undisturbed,they settled down. So, they need stabilizer not to let them settle down.

The process of making eco-friendly colors：

Red: In dry: mix red sandalwood powder with flour (1:1) make powder of dry red hibiscus flowers and add flour to i (1:1).

In wet: boil small pleases of beetroot in water and strain the liquid. add more water in case you want to dilute the deep pink.

Yellow :

- In dry: mix one tablespoon of turmeric powder with 2 tablespoons of gram flour(besan) (1:2).
- In wet: mix turmeric with water soak peels of pomegranate overnight in water and strain the liquid boil Marigold are palash flower in water.
- Turmeric powder and gramme flour can be used to make yellow colour. The finest part is that it also works as a face pack, making skin soft and subtle. Instead of gramme flour, you can use talcum powder, fuller's earth, or multani mitti.

Green:

- In dry: mix henna powder with flour.
- In wet: mix a paste of mint(pudina)/spinach(palak) with water and strain the liquid. dilute it with water to get the right colour.
- Drying a lot of neem (margosa) leaves in direct sunshine and grinding them into a fine powder is one approach to get a great, brilliant green Holi colour. Dried methi or mint leaves are further alternatives to neem leaves. With these elements, the colour is created in the same way.

Brown

- In dry: mix powders of henna, gooseberry and turmeric.
- In wet: mix pan Kattha with water to get the brown colour you want.

Blue:

- In dry: mix small quantity of indigo powder with flour(1:3) order of blue hibiscus flowers and add flour to eat(1:1).
- In wet: mix indigo(powder or liquid) with water.
- Those blossoms in the summer and may easily be dry, powdered, and smashed for an environmentally friendly result. Blue hibiscus, on the other hand, can be utilised to achieve a similar result. Blueberries could be mashed and dissolved for liquid natural colour, depending on the concentration desired.

Black:

- In dry: mix all the above colors(read, blue, green and brown) to get a brownish black powder.
- in wet: soak dried gooseberry (Amla) overnight in an iron vessel and strain the black liquid.
- Whngooseberries or amla are boiled for a few minutes in an iron container, they turn black. After heating them, set alone for a while and then diluted with water. It can also be used as a hair conditioner.

Conclusion

There is scope for commercial production of 'holi' powder using our method. Sustainable development is need of the hour. To preserve nature and its eccentricity along withits biotic component for the further succeeding generation, we need to find and utilize an alternative eco-friendly method. The synthesis of colors by using environment friendly methods is becoming increasingly important. Frequent use of synthetic colours having hazardous chemicals in the process of manufacturing, leads to harmful and can adversely affectour skin and polluting our environment. Therefore, let us try to change our attitude on the eco-friendly method for producing colours without using chemicals. Such powders may have unexpected effects if they come into touch with the skin (dermatosis), respiratory tract or eyes. These are also damaging to the environment because they are poor recyclable and resistant to traditional wastewater purification methods. Let us pledge during Holi.

- Don't use the chemical colors.
- use natural colors.
- the natural colors come from trees, vegetables, fruits and flowers.
- the natural color is not harmful for the skin.

So, let us make our own colors and celebrate holi in a safer mode.

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