



“SYNTHESISING NATURAL INK FROM INDIAN BERRIES”

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ABSTRACT Objective of this research was to distil inks from natural resources by an aqueous pulp extraction method. Intent of the project was to promote sustainability and minimise health hazards that occur due to VOC emissions.

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects.

The Aim of the project was to provide safe and good quality inks (free of VOCs) for the printing industry. The inks produced as part of this project were found to be effective, easy to apply and the prints were stable too.

KEYWORDS :**PROJECT DESCRIPTION**

The method of natural inks preparation is not new, it is as old as our civilization. The art of using natural color is very old and still used in some parts of India, but on small scale, due to easily availability of synthetic dyes, long lasting color and low cost. But synthetic inks have many disadvantages, like health hazards and environmental issues which, along with other such material, have led to investments in research. There is a heightened focus on discovering more organic products that can help reduce the world carbon footprint and boost sustainability.

In 1996, Germany was the first country to ban azo dye (synthetic dye) for the printing industry which causes harmful effect to the environment with emission of the Volatile Organic Compounds (VOCs).

Natural inks are considered eco-friendly because they are derived from natural resources like plant leaves, root, fruits, and minerals sources. There are more than 500 dye yielding plants in nature giving different shades of color. China circa 2600 BC, was the first country to use natural dyes. India has a rich history of using natural dyes for printing books and paintings, the still existing Ajanta paintings in Aurangabad (from 2nd century BC) are a great example of longevity and existence of such dyes.

There is an increasing interest among consumers for natural dyes and inks especially those who are aware about the harmful effects of synthetic inks and dyes. However, there are several challenges in this field where we need more technology focus to make this initiative a large-scale possibility.

In this study, an attempt was made to generate water-based ink with simple aqueous method using Indian berry called “Jamun”. Jamun or Jambul or Jamblang (*Syzygium cumini*) is an evergreen tropical tree that grows up to 30 meters and lives over 100 years. Native to South Asia, the tree bears fruit which is an oblong and ovoid berry, that changes colors as it grows. It is green when just appearing, pink as it matures and shining crimson – black when fulling ripe. While the water-resistant wood is used for making cheap furniture, seed of the plant has medicinal powers, especially for diabetes. The seed is also used in various alternative healing systems like Ayurveda, Unani and Chinese medicine for digestive ailments.



Natural inks made from organic resources are different from synthetic inks. Synthetic inks have colorants (titanium dioxide, calcium carbonate, lithol etc.), resins (ethyl cellulose, acrylic resins, polyvinyl acetate etc.),

solvents (toluene, mineral oil, acetone, methanol etc.), additives (phenol, titanium chelates, silicones, cobalt & manganese compound).

While in this experiment, natural agents were used for colorants:

- betanin and vulgaxanthin from beetroot,
- curcumin from turmeric,
- tannic acid from dried gooseberries

Along with resin (gum acacia), solvent (water) and additives (vinegar, salt).

THEORY

Inks, natural or synthetic, are composed of four basic retention and preservation components. These are:

- Pigment
- Solvent
- Resin
- Additives

Comparison between components of synthetic and natural ink:

#	Components of Ink	Synthetic Ink	Natural Ink
1.	Solvent	Toluene, mineral water, acetone etc.	Water
2.	Resin	Ethyl cellulose, acrylic resins etc.	Gum acacia
3.	Pigment	Titanium dioxide, lithol etc.	Ferric tannate, curcumin
4.	Additives	Phenol, titanium chelates etc.	Vinegar, salt, arrow root

APPARATUS REQUIRED

- 250 gm jamun pulp (pigment)
- 200 ml water (solvent)
- 1 tbsp salt (preservative)
- 3/2 tbsp arrow root powder (additive)
- 1 tbsp gum acacia (resin)
- Gas stove
- Thermometer

PROCEDURE

Steps involved in ink preparation are as follows:

- Grind 250 gm of jamun pulp with 200ml of water for 2 minutes.
- Boil the paste at 70°C for 30 minutes. Intent is to make the harmful bacteria and enzymes present in the sap inactive.
- During this boiling process, coloring component anthocyanin present in Jamun dissolved in water and gives a crimson-black (close to purple) color.
- Filter the sap using muslin cloth and boil again to reduce the concentration to 100 ml.
- Add to the concentration:
- 1 tbsp of salt (as preservative),
- 1½ tbsp of arrow root powder (for viscosity),
- 1 tbsp of gum acacia paste as resin
- Boil the sap till the consistency of ink changes.

OBSERVATIONS

Natural jamun ink gives good colour strength of purple colour when printed on paper. It is easy to prepare, economical and gives good print quality.

CONCLUSIONS

Following are the conclusion from this research work:

- Jamun ink is feasible for printing on paper.
- Prepared ink is eco-friendly and easy to decompose.
- Purple jamun ink can be a good alternate to synthetic inks
- More research required in this field to standardize the product for mass production and utilization
- It's good to use only fresh and ripe vegetables and fruit for ink preparation.
- Lives of prepared inks are from 40-45 days, but quality of print is as good as other inks.
- Storage of inks should be proper in cool, dry and dark places for preservation, else ink can get spoilt.
- Different variation of shades can be produced by changing the concentration of colorant.
- Easy to dispose because of no harmful chemicals used as raw material.

PRECAUTIONS

- Heating on gas stove must be done carefully and under supervision.
- Thermometer must be carefully handled under heat.
- Ink must first be sampled before large scale use.
- Storage of inks should be proper in cool, dry and dark places for preservation, else ink can get spoilt.

APPENDIX

#	Artefact	Remarks
1.		Filtering of the sap with a muslin cloth
2.		First concentrate (crimson – black colour)
3.		Boiling the concentrate at school labs
4.		First experiments on an antique typewriter by applying ink on its ribbon to print the letters
5.		Sample ink prints from an antique typewriter
6.		Shreya at the job!

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