

Herbal Ink: Safe, Easy and Ecofriendly Alternative

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ABSTRACT

Nature has gifted us more than 500 colour yielding plants. India is a major exporter of herbal dyes due to forbid on production of some of synthetic dyes in developed countries due to environmental pollution problem. A survey in primary school indicated that few children inadvertently ingested ink, currently it is observed that only synthetic ink are used which may be harmful for children health. Hence for benefit of children, it was thought worth to prepare edible ink. Four herbal inks were prepared from different biological sources such as *Beta vulgaris* (Beet Root) Chenopodiaceae, *Citrus limonene* (Citrus peel) family Rutaceae, *Pentas lanceolata* (Butterfly Flow petals) family Rubiaceae, *Bauhinia purpurea* (Butterfly tree) family Caesalpiniaceae etc. The herbal inks were evaluated for several parameter such as Color, Odour, Taste, Brightness, Drying time, Flow ability, Non-clogging nature, Viscosity, Permanency of colour, Stability. All inks were found to edible, safe, easy to prepare and stable.

Keywords: Plant extracts, Water, Vinegar, Alcohol.

INTRODUCTION

Ink is a liquid or paste that contains pigments or dyes and is used to color a surface to produce an text, picture or design. Ink is used for drawing or writing with the help of pen, brush. Ink can be a complex medium, composed of solvents, pigments, dyes, resins, lubricants, solubilizers, surfactants, particulate matter, fluoresces, and other materials as shown in Fig No 1. The components of inks serve many purposes; the ink's carrier, colorants, and other additives affect the flow and thickness of the ink and its appearance when it dry¹.

History reveals that Chinese have recorded the use of dye even before 2600 BC. In middle of 1800, chemists began producing synthetic substitutes². By early 20th century only a little percentage of fabric dyes were extracted from herbal sources. There has been rising interest in herbal dyes and ink as consumers have become conscious of ecological and environmental problems³. Natural dyes are now a days in demand not only in textile industry but in cosmetics, leather, food and pharmaceuticals because no disposable problems as are biodegradable.

Ink is a liquid that contain pigment. Dye based inks are usually much stronger than pigment based inks can produce much extra colour of density, because dyes are dissolved in liquid phase.

Several natural dye yielding plant are available medicinal value, such as aloe (cathartic), adhatoda vasica (bronchial), indigo feranticto (epilepsy) crocus sativus (sedateve). Herbal ink overcomes few of problems lead by synthetic ink via less expensive and not tedious process, Nontoxic, Safe to use in foods and confectionaries. They are obtained from renewable sources. Herbal dyes are less toxic than chemical dyes, and some of natural dye are

permitted as food additives like saffron, Beet Root, Annatto, Elderberry, Pandan, Butterfly pea, turmeric⁴. In this study few plant species such as *Beta vulgaris* (Beet Root) family Chenopodiaceae, *Citrus limonene* (Citrus peel) family Rutaceae, *Amelanchier arborea* (Butterfly Flower petals), *Bauhinia purpurea* (Butterfly tree) family Caesalpiniaceae were chosen for preparation of herbal ink. These plants are easily available with added pharmacological activity such as hypotensive, cardiovascular protective, vasodilatation, anti-fungal, antibacterial, etc.

MATERIALS AND METHODS

Collection of Plant Material and Authentication: *Beta vulgaris*, *Citrus limonene*, *Pentas lanceolata*, *Bauhinia purpurea* were collected from local market and authenticated at National Research institute of Basic Ayurvedic Sciences, Pune. A voucher specimen obtained was 4407.

Preparation of maroon ink from beetroot (*Beet vulgaris*) by simple extraction

Biological source: It consists of the roots of *Beta vulgaris* of family *Chenopodiaceae*⁸.

Materials: Beetroot-250g, Vinegar-10ml, Water-1000ml

Method: Beetroots were chopped and grinded. To the grinded paste 500ml of water was added. Then it was boiled for 45 min and is cooed and filtered with help of muslin cloth. Re-extracted using double the quantity of water and concentrate to

the 200ml of the concentrated extract. 5-10ml of vinegar was added. It was filtered and stored in an air tight glass bottle in a cool place away from light.

Preparation of yellow ink from Citrus fruit

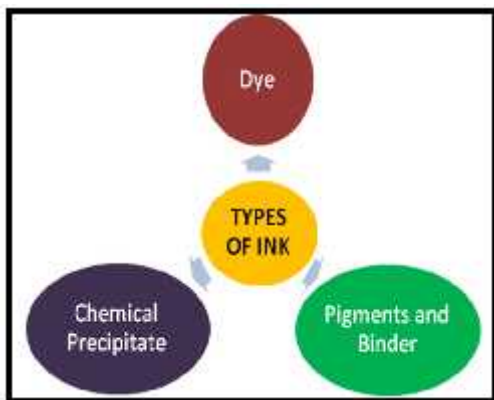


Fig. 1: Types of Inks

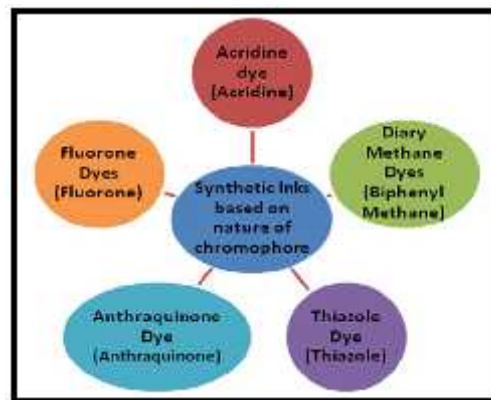


Fig. 2: Synthetic Inks based on nature of chromophore

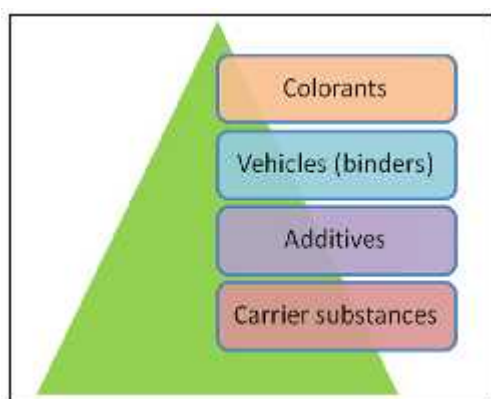


Fig. 3: Ink formulas⁵.

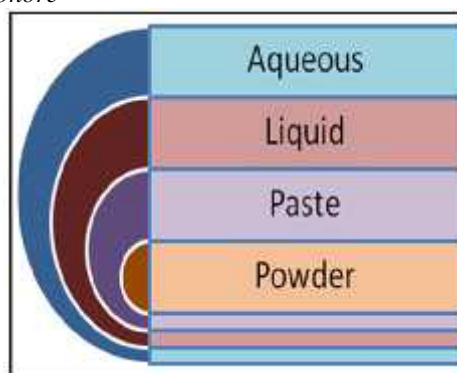


Fig. 4: Four Classes of Ink



Fig. 5: History of Ink^{6,7}.

Biological source: Fresh Citrus peels of *Citrus limonene* family *Rutaceae*. Citrus is a common term and genus (*Citrus*) of flowering plants⁹.

Materials: Citrus fruit peels -20g, Vinegar-5ml, Water-500ml

Method: 20grams of citrus peels was grinded. To this 500ml of water was added and boil for 60 mins. The extract was filtered. Again it was concentrated to half of its volume by heating. To this final extract 5ml of vinegar was added. It was filtered and stored in air tight glass bottle in

a cool place away from sunlight.

Preparation of Red ink form *Pentas lanceolata*

Biological source: It consists of flowers obtained from plants *Pentas lanceolata* of Family *Rubiaceae*.

Materials: *Pentas lanceolata* flowers-20g, Alcohol -5ml, Water-500ml

Method: 20 grams of Flower patels was grinded, to this 500 ml of water was added and boiled for 90mins, then it was filtered and concentrated for 45 mins. It was cooled



Fig. 6 : Plant Source



Fig. 7 : Grinded material



Fig. 8 : Extraction of Beet Root



Fig. 9: Beet Root Ink

Table 1: Effect UV rays on Ink (Stability)

Parameter UV rays / sunlight	<i>Beta vulgaris</i> Ink	<i>Citrus limonene</i> Ink	<i>Amelanchier arborea</i> Ink	<i>Bauhinia purpurea</i> Ink
1st day of exposure	No change in colour	No change in colour	No change in colour	No change in colour
2st day of exposure	No change in colour	No change in colour	No change in colour	No change in colour
3st day of exposure	No change in colour	No change in colour	No change in colour	No change in colour
4st day of exposure	No change in colour	No change in colour	No change in colour	No change in colour
5st day of exposure	No change in colour	No change in colour	No change in colour	No change in colour
6st day of exposure	No change in colour	No change in colour	No change in colour	No change in colour
7st day of exposure	No change in colour	No change in colour	No change in colour	No change in colour

Table 2: Effect of UV rays and sunlight on Ink - 2nd week of exposure

Resistant to UV light	Low (1 to 3 days)	Medium (3rd day to 7th day)	High (After a week)
<i>Beet vulgaris</i> (Maroon Coloured Ink)	No change of colour	No change of colour	No change of colour
<i>Citrus limonene</i> (Yellow Coloured Ink)	No change of colour	No change of colour	No change of colour
<i>Pentas lanceolata</i> Flower (Red Coloured Ink)	No change of colour	No change of colour	No change of colour
<i>Bauhinia purpurea</i> Flower (Purple colored ink ink)	No change of colour	No change of colour	No change of colour



Fig. 10 : Plant Source



Fig. 11 : Grinded Citrus Peel



Fig. 12 : Citrus Ink (*Citrus limonene*)



Fig. 13: Plant Source



Fig. 14 : Grinded material



Fig. 15 : *Pentas lanceolata*



Fig. 16: Plant Source



Fig. 17: Grinded material



Fig. 18: Extract

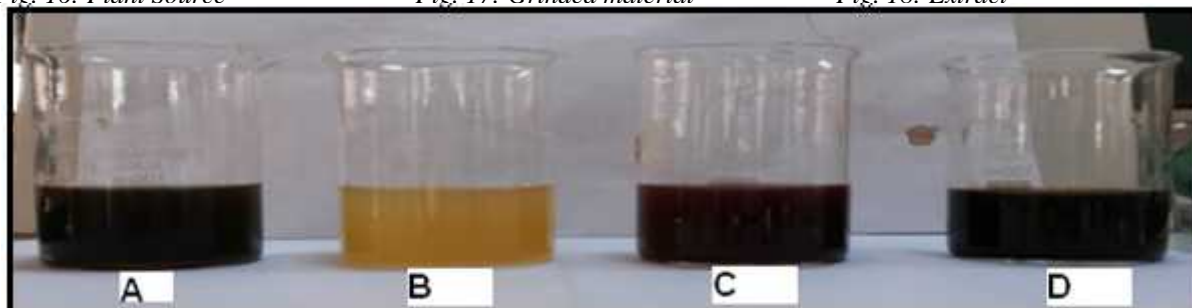


Fig. 19: Herbal Ink from A: *Beet vulgaris* ,B:*Citrus limonene* ,C:*Pentas lanceolata* ,D:*Bauhinia purpurea*

Table 3: Evaluation parameters

Parameter	<i>Beet vulgaris</i> ink	<i>Citrus limonene</i> Ink	<i>Pentas lanceolata</i> Ink	<i>Bauhinia purpurea</i> Ink
Flow ability	Freely flowing	Freely flowing	Freely flowing	Freely flowing
Clogging nature	Non clogging	Non clogging	Non clogging	Non clogging
Colour	Maroon	Yellowish	Red	Purple
Brightness	Dark	Light	Dark	Dark
Permanency of colour	3-8 days	3-8 days	3-8 days	3-8 days
Stability	Stable	Stable	Stable	Stable
Taste	Pleasant and sour	Characteristic	Aromatic	Characteristic
Drying time	7-9 sec	7-10 sec	7-9 sec	7-15 sec

and filtered till clear solution was obtained. Add 5ml of alcohol. Red dye obtained was stored in air tight glass bottle in a cool place away from sunlight.

Preparation of purple colored ink from *Bauhinia purpurea*

Biological source: It consists of flower obtained from plants *Bauhinia purpurea* of family *Caesalpinaceae*.

Materials: Flower-250g, Vinegar 5ml, Water-500ml

Method: 20 grams of Flower petals was grinded, to this 500 ml of water was added and boiled for 90mins, then it

was filtered and concentrated for 45 mins. It was cooled and filtered till clear solution was obtained. Add 5ml of alcohol. Brown colour ink obtained is stored in an air tight glass container away from sunlight.

RESULT AND DISCUSSION

Four inks were prepared, maroon colored ink from *Beta vulgaris*, yellow colored from citrus peel and red colored ink from *Pentas lanceolata*, purple colored from *Bauhinia purpurea*. The prepared ink was filled in an ink pen and following character was studied and evaluated. The effect of UV rays and sunlight on the prepared ink was studied. The results are tabulated in Table 1, 2 and 3. There was no visible change of colour of the ink in one week of exposure. All the inks were free flowing, non clogging and correct colour concentration. All the synthesized inks showed colour permanency for 1 week varying between 3-8 days. Further they were stable.

CONCLUSION

Colours produced from synthetic dyes are more consistent from batch to batch than colours produced by natural colorants. However, natural dyes are an eco-friendly way to impart almost any colour to textile product with the recent interest in environmental concerns; natural dyes might be a good way to produce unique products with a green slant. Increased use of herbal dye is due to Exploration of new resources, increase yield of dye by different biotechnological techniques, it also give opportunity for establishment of long term sustainability and dye yielding substances by cultivation of plant source, to develop technology for application of herbal dye to wood, floral, leather, cosmetics, paper and personal care products along with the economy, ecological aesthetic and social advantages. In this direction, for betterment of our

environment, four Herbal Inks have been prepared and the preparation methods were standardized.

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