Production of Floral Dye from different flowers available in West Bengal for Textile & Dye Industry

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Summary:

Floral dye can be used as dyeing material for dyeing the Textile Fibre as well as making colorful powder.

Keywords: Flower, Floral dye, Herbal Gulal, Environmental pollution

Extended Abstract

In India a huge amount of flowers are cultivated & West Bengal is the 4th position to cultivate flowers after Andhra Pradesh, Karnataka & Tamilnadu. These flowers are used as decoration purposes or for offering to God. A survey report reveals that 40% of the total productions of flowers are unsold and wasted everyday which are thrown in water of river Ganga or dumped which also creates water pollution as well as environmental pollution. These wasted flowers can be used in various ways & we can get wealth from waste materials.

The various uses of these wasted flowers are:

a. Extraction of colourful dyes from these flowers and use it in textile Industry for dyeing purpose.
b. These colourful dye are used to making Herbal Gulal (Abiir).
c. The residual waste portion can be used as bio-fertilizers.

Colouful dye can be extracted from flowers for dyeing textile fibre. These floral dye are eco-friendly & it has no allergic action on skin like synthetic dye. Moreover the procedure is very cost-effective and depending on it small scale Industry as well as Large scale Industry can be set up. The laboratory & pilot plant work & is going on at Chemical Engineering department, Jadavpur University with collaboration with Moromi, a NGO of West Bengal. Beside this these colour can be used to making colourful herbal Gual which has no side effect on skin.

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Introduction

Dyeing of textiles mean giving them a colour which is of comparative permanence[1,2,3]. It implies that it should not be possible to wash the colour out easily in laundering, nor should it fade rapidly when exposed to light. Natural dyers in vogue during ancient days were Indigo for dark blue/ light blue, pomegranate vined for yellow/ brown/ green, lac for scarlet/ crimson/ purple, jackfruit heart wood for yellow/ green, majisha root for rust red, myrobalan for khaki/ green/ black Compound shades were also got by over dyeing of yarn with two colours or by cross weaving. These natural dyes were eco-friendly and more importantly non-carcinogenic, unlike the synthetic dyes in use now.

The discovery methods of synthesizing alizanin and indigo spelt the death knell of the indigenous industry. Due to the ease of application, bright shades obtained and the hard shell of the colonial rulers, hand weavers started to opt for synthetic dyes without a clear understanding of the using of these.

It is now suspected that many of the synthetic dyes are carcinogenic in nature and havoc in life systems. It's ironic that Europe that initiated the advent of synthetic dyes in the first place woke up the dangers of these agents and turning down for a few members of these class, proven to be harmful to life forms.

Herbal dyes however produced from floral extracts are economical and solve the above problems. These herbal dyes are not toxic, no allergic to human health, easily available and more economical. Some natural sources for dye produce truly exquisite shades and economical to purchase than chemical dyes. Upto now most of the natural dyed textiles are imported from Third World Countries and India is still a major producer of it. Flowers of Mari-gold, China rose, Butterfly Pea, Bougainvillea, Cineraria, Alkanet etc have been extensively used for dyeing fabric.

In India specially in West Bengal, a huge amount of flowers are wasted everyday. A survey report reveals that among India, West Bengal is in 4th position to cultivate flowers after Andhra Pradesh, Karnataka & Tamilnadu. Another survey report on area & production of flowers in West Bengal (03-04) shows that in West Bengal, 4.104 hactor Areas are used for

cultivation of marigold flower & almost 33.099 tonnes of flowers are produced in year 03-04. For China rose it is 2.71 hactor area & 43.557 tonnes. Survey reports also reveals that almost 40% flowers are unsold of total flower production and wasted which are thrown in water of Ganga river or any other places which creates water pollution.

But these flowers can be used to extract dye which can be used as natural floral dye for colouring textile fibre. These natural dye are cost effective, eco-friendly & renewable and has no allergic action on skin.

The main objectives of the work are:

i) Extraction of natural dye from flowers like Marigold, China rose, Balsam, Bixa etc by efficient process for colouration of textile fibre.
ii) Using natural dye in spite of chemical dye so that environmental pollution due to chemical dye can be restricted.
iii) Using these dye in Textile Industry for colouring the Fibre
iv) Using these dye in Food Industry.
v) Using these dye for making colourful Candles
vi) To help the Flower cultivator & village below poverty people who can earn using these technology.

NATURAL FLORAL DYE CHARACTERISTICS:

Majorities of the natural dyes are having the hydroxyl group[4] in its nucleus & they are sparingly soluble in water. Increase in solubility may be achieved by adding alkali such as Sodium carbonate to the aqueous solution. Some of the natural colourants[5] don't have a solubilising group in which case a temporary solubility group is generated at time of application.

For a substance to act as dye, certain condition must be fulfilled:-

i) It must have a suitable colour.
ii) It must be able to fix or must be capable of being fixed to fabric.
iii) It must not be fugitive after fixing on fabric to be dyed.

The flower contain many chemical substances: Carbohydrates, minerals, mucilage, vitamins (especially riboflavin, thiamin), pigments including crocin, anthrocvianin, carotene, lycopene, zigzantin etc.

MATERIALS, METHODS & DISCUSSIONS:

Yarn & Fabric: Bleached cotton fabric is used for the studies.

Aqueous Extract of colour from fresh Flowers[6]:

Dye from different flowers are extracted separately in the proportion of 1:2 of flower by aqueous extraction and the extraction process is carried out at a temperature range of 80 - 85 ^{0}C for 1 hour. Colouring materials from the flowers are extracted to dyeing the fibre. After the extraction procedure is complete, the flowers are taken out from liquor and they are taken for extraction of dye for second time. Experimentally it is seen that at temperature range $80^0 – 90^0$C & time 1 hr, the extraction is better, so this is the optimized time & temperature for extraction process.

Mordanting of Textile Fibre:

The sample of cotton is mordanted before dyeing. For mordanting we use different mordanting agents like Alum, Copper Sulphate, Ferrous Sulphate, Stannous Chloride, Chrome-Alum etc have been used. The fibre is mordanted for 1 hr at the temperature range 80 - 85 ^{0}C. After mordanting, the samples of clothes are taken out, squeezed and then immersed in the dye bath.

Procedure of Dyeing of cloth:

The mordanting samples are immersed in dye bath for 2 hr at a temperature range of 80 ^{0}C and after completion of dyeing; samples are taken out and dried. It is allowed to be aged for a fixed time, and after that soaped with 2g/l non-ionic soap at room temperature for 10 minutes followed by rinsing and line dyeing.

EXPERIMENTAL RESULTS & DISCUSSIONS:

Figure1: Temperature effect on extraction of dye from Marigold flower

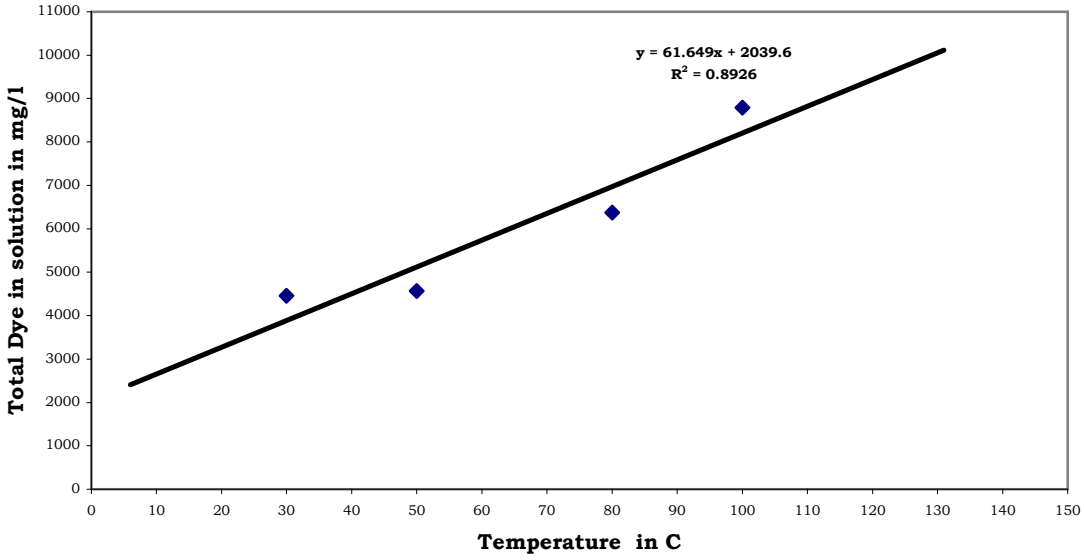


Figure 2:-Extraction of Marigold flower dye with different Reagents

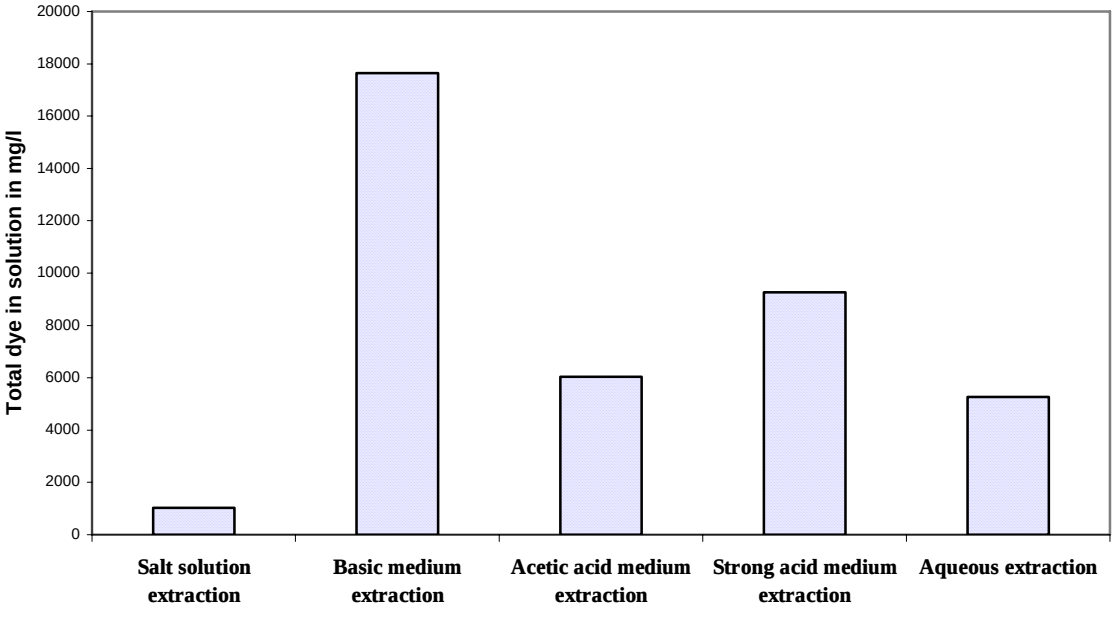


Figure 3:- Temperature effect on extraction of dye from China Rose flower

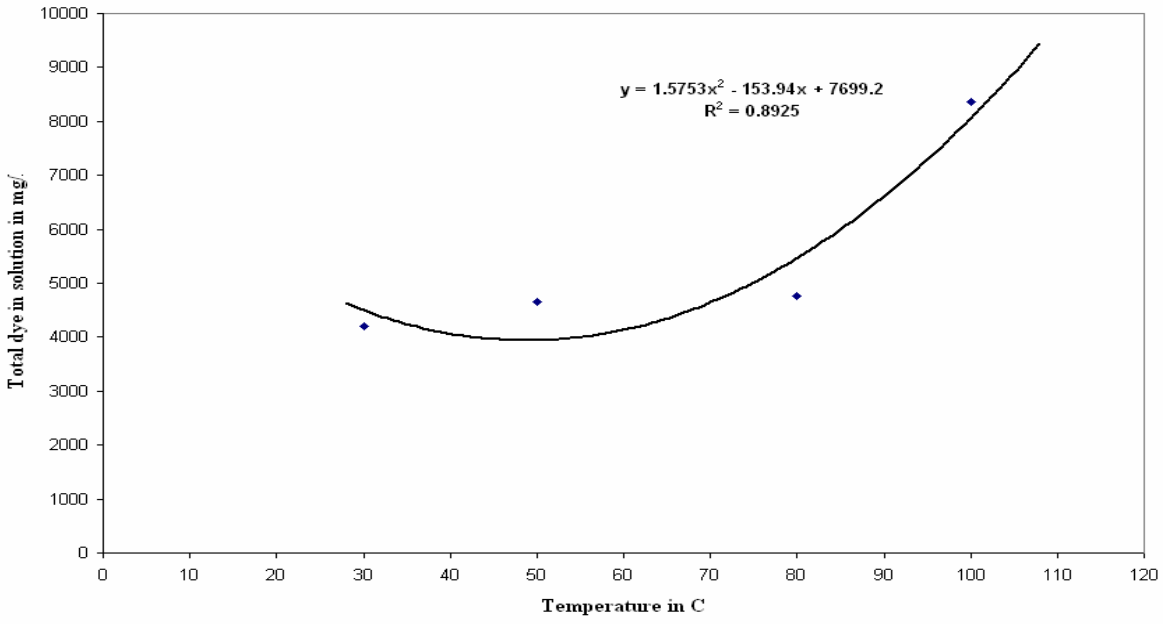


Figure 4: Extraction of China rose flower dye with different Reagents

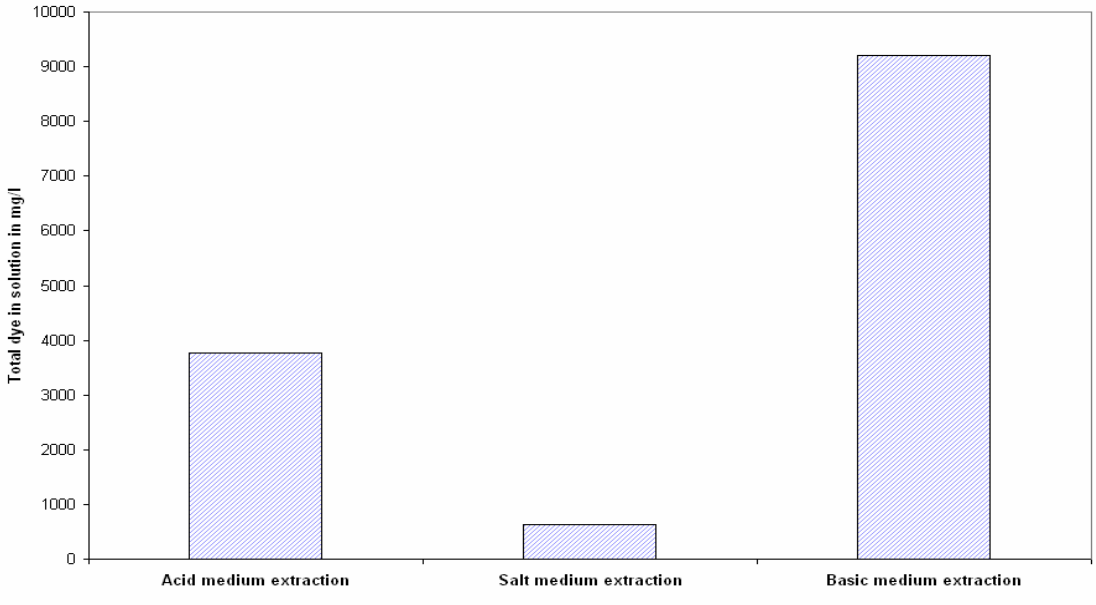


Figure 5:- Extraction of Aparajita flower dye with different Reagents

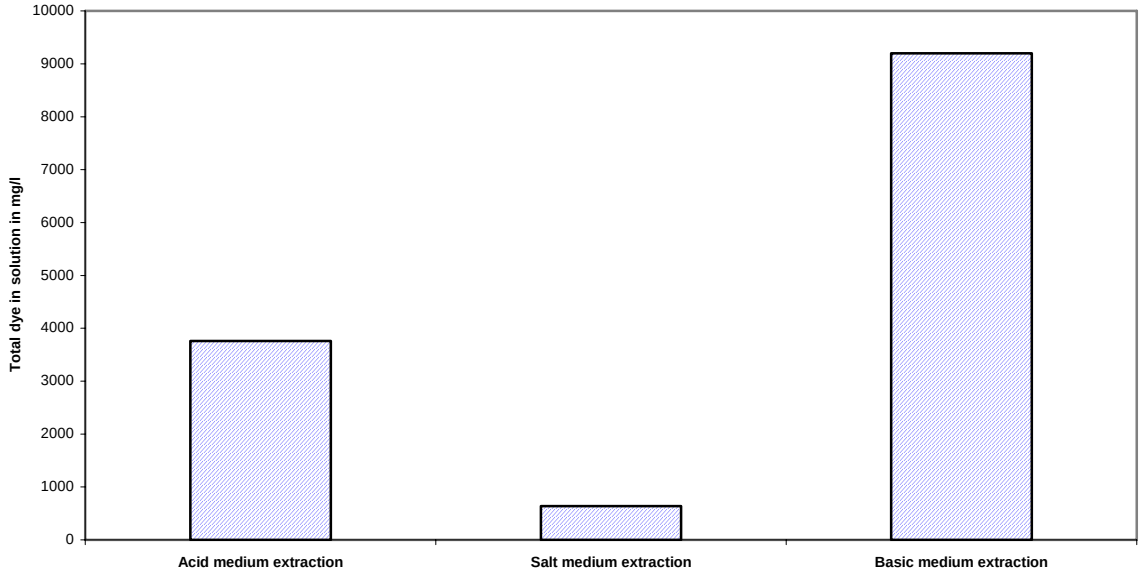


Figure 6:-Time effect on extraction of dye from Aparajita flower

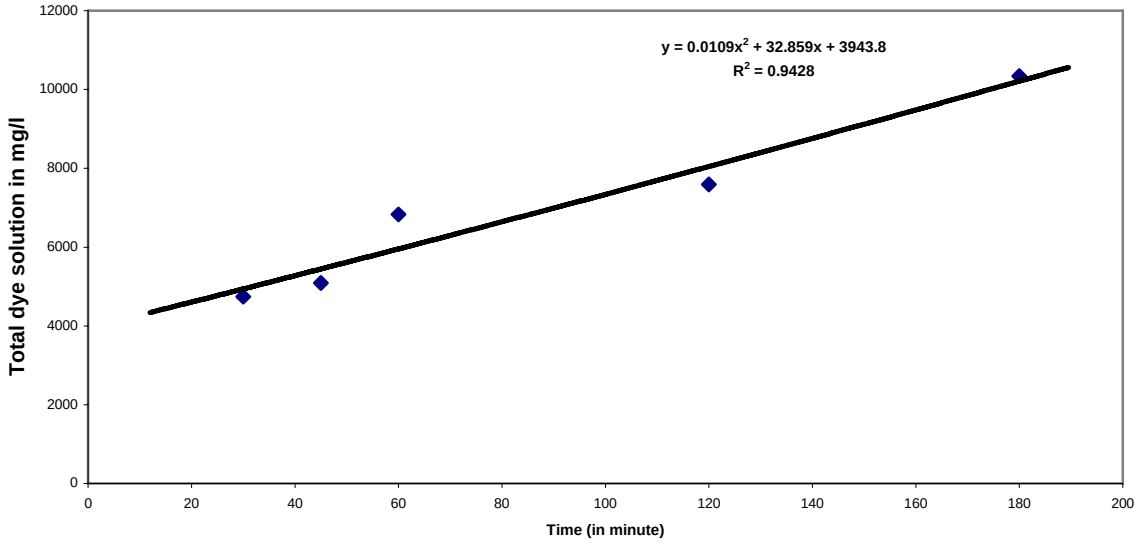


Figure 7:- Time effect on extraction of dye from Aparajita flower

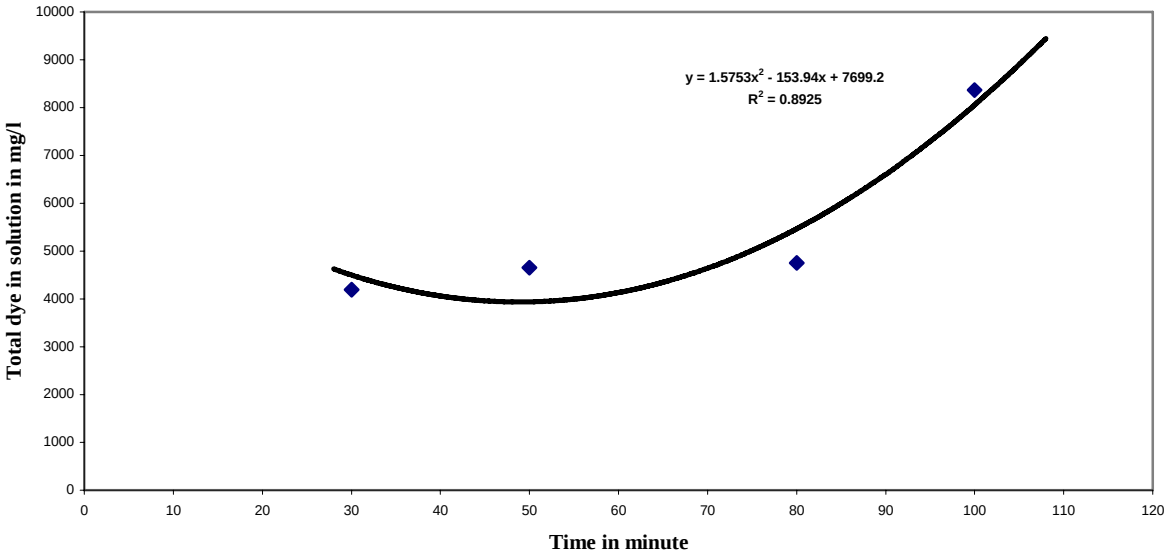


Figure 8:-Extraction of Dye from Bixa with different reagents

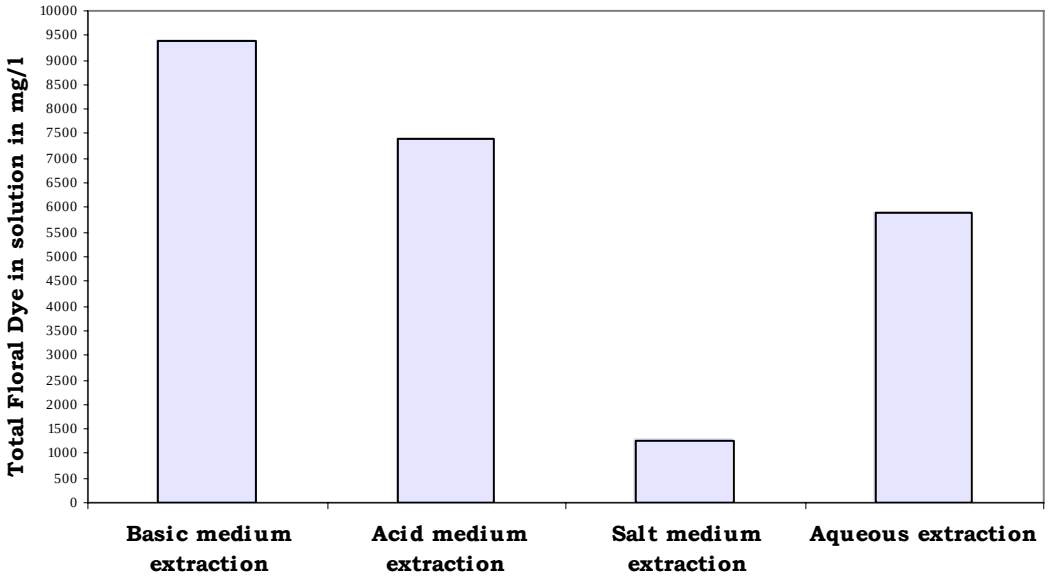


Figure 9:-Temperature effect on extraction of dye from Bixa

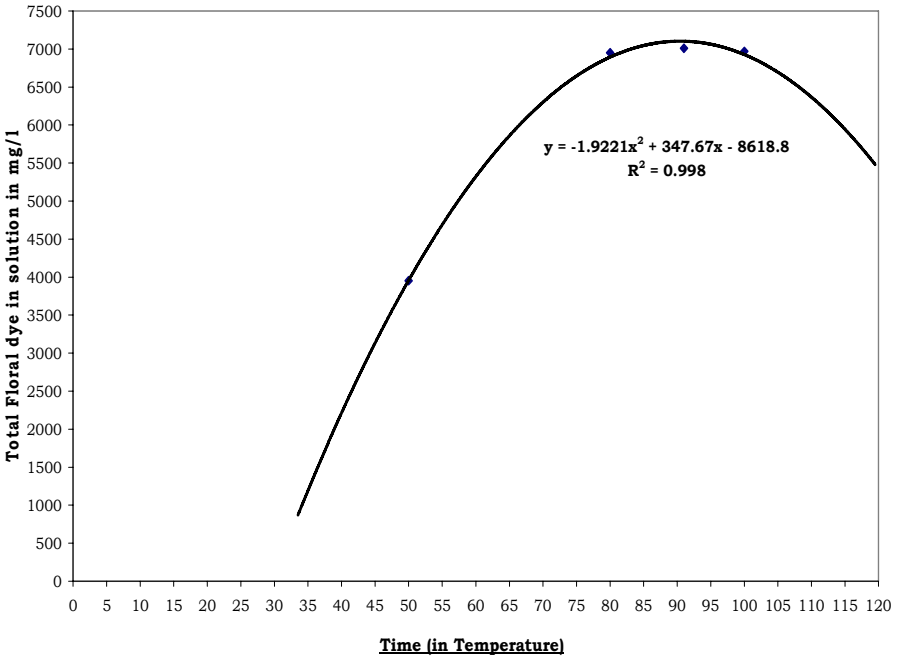
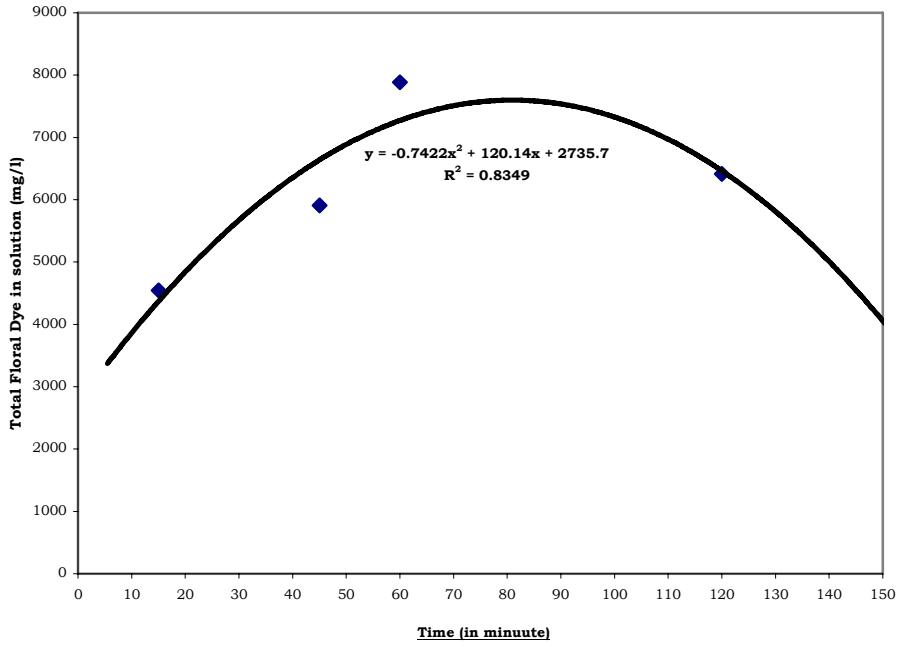


Figure 10:-Time effect on extraction of dye from Bixa



From Table 1 – 10, it is observed from all the experiment that extraction is favoured in temperature 80 – 90^0 C, at 1 hr – 2hr. The extraction is favoured at higher temperature, but as at higher temperature, there is problem of charring of dye, the favourable temperature is 80 – 90^0C. The colour purity of the samples shows good results from flower dye. The light fastness properties are tested by exposing in normal day light by putting samples behind window glass. Using grey scale assesses the colour change. The extent of fading is assessed by grey scale. The wash -fastness is also tested using grey scale according to the method IS: 764 – 1984 at 60^0C for 30 minutes. The results indicate that the colour fastness of the samples dyeing with Marigold, China rose flowers are around 3 – 4 where as 5 is the higher concentration rating. The lower rating may be due to the darkening of shade resulting in higher contrast & so poor rating. From the overall results it is seen that dyeing with alum give better result (both in light fastness & wash fastness) in respect of all other mordant. Stannous chloride used as mordant also gives better results, but the cost of this mordant is high. Not only that in food coloured also it shows good result. The metal ion composition is analysed using Atomic absorption Spectrophotometer & here also it is seen that ion concentration is very low below permissible limit.

CONCLUSION:

The present work shows that different flowers can be used as dye (yellow,green & blue colour). These flowers are available in Eastern India & are grown almost every season. We can get different shades of colour using different mordants & the colour fastness, wash fastness properties also can be improved by different treatments procedure and so it can be used in small scale Industry as well as in large scale Industry also. This colour dye has no side effect on skin & it has no harmful effect on environment also. The process is economically viable as the raw materials are available with low of cost and so cost of production is also very low.

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