

# SUBSTITUTE INDELIBLE INK USING *Bixa orellana* L. (ANNATTO) AND *Corcus sativus* L. (KASUBHA) EXTRACTS

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## ABSTRACT

*The great concern of the government and the people of every country are to have a clean and safe election. Silver nitrate in making indelible ink is one of the major problems because of its toxicity and corrosiveness. This study was conducted to find out the feasibility of annatto seeds (*Bixa orellana* L.) and kasubha (*Corcus sativus* L.) together with cartridge ink as an alternative indelible ink. The two plant extracts were mixed with the cartridge ink in four different ratios. Each of them was applied to the fingernails of the three respondents. After which, days of adherence were determined by counting the number of days the ink adhered to the fingernail. Reaction of the ink to different medium was also determined by putting 1.5 mL of water, alcohol and acetone to the fingernail. The time, in seconds, it takes to erase the ink was noted using a stopwatch. Lastly, a visual quality rating was done to determine the stability of the ink after applying to the fingernail.*

*Results of the study confirmed that *Bixa orellana* L. can be a powerful source of an effective adherence in making an indelible ink.*

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## INTRODUCTION

The demand for a clean and safe election has been a great concern of the government and the people of every country. And one of the major problems is the use of silver nitrate in making indelible ink because it is toxic and corrosive. Silver nitrate can affect when you inhaled and by passing through the skin. It is also corrosive and contact can severely irritate and burn the skin and eyes with possible eye damage (New Jersey Department of Health, 2009). Studies conducted by the Electoral reform non-governmental organization showed that silver nitrate could be cardiogenic or can cause damage to the kidneys (Wong, 2013).

Silver nitrate as an indelible ink works like a dye that stains a certain material. Some studies showed that plants such as herbs can be used to make dye. Herbal dyes being natural tend to be softer and their range of tones very pleasant (Gokhale et al, 2004). With this current knowledge of dyes extracted from plants, it is now a query if this dye can be used as a substitute for election ink.

This study was conducted to find out the feasibility of natural plant dyes from the market and cartridge ink as an alternative indelible ink.

In the aim to produce an alternative indelible ink using annatto and kasubha extracts and is also comparable in quality to the commercial ink, the researchers intend to answer the following questions:

1. Will the alternative indelible ink adhere when applied to fingernail?
2. What will be the effect of the natural dyes to the days of indelibility of the ink?
3. What is the reaction of each ratio to the following solutions which are water with soap, acetone and alcohol?

The utilization of cartridge ink and natural dyes in the production of a safe, low-cost and reliable indelible ink as alternative for the commercial ink will be of benefit to the following members of the community:

**Voters.** In using the indelible ink from natural dyes sources and cartridge ink, electioneering as one of the odds during election, can be avoided since the ink produced is competitive with the

commercially manufactured product in use. It is also safe when applied.

**National Government.** The low-cost indelible ink in its perfection will lessen the government budget every election and other activities where this kind of ink will be in demand.

**Researchers.** They can develop the information of the study to make an improved one which is more reliable to use.

The major concern of this study is to produce an alternative and safe indelible ink using plant dyes. The study utilized cartridge ink and plant leaf extracts from atsuetes and kasubha in the making of dyes.

In order to meet a satisfactory solution, different ratios were studied and tested. Tests for the feasibility of the mixture used were conducted in terms of qualities of a good indelible ink.

Chemical analyses of the extracts were beyond the study. The study was conducted from July to August 2013 in the residences of the researchers in Cavite City.

## METHODOLOGY

The procedures in creating and testing of the alternative indelible ink are as follows:

*Preparation of Materials.* One gram of atsuetes seeds and 1.5 g of kasubha were collected and measured using a weighing scale. Two sets of 50 mL tap water were collected for extracting the kasubha and atsuetes seeds. The prepared atsuetes and kasubha were boiled in 50 mL tap water placed in a separate casserole and heated on a stove. The extracts were placed in two small bowls and waited until it cools down.

*Creation of the Alternative Indelible Ink.* Four set ups were prepared with different ratios that are listed below.

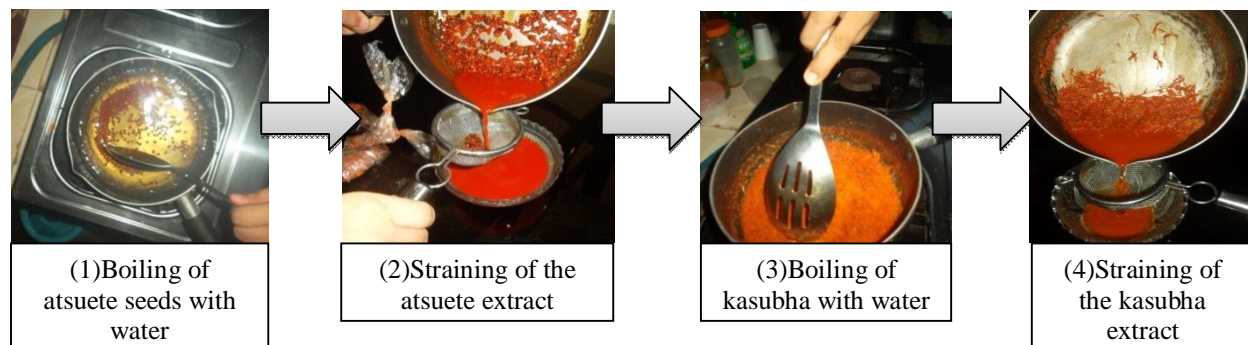


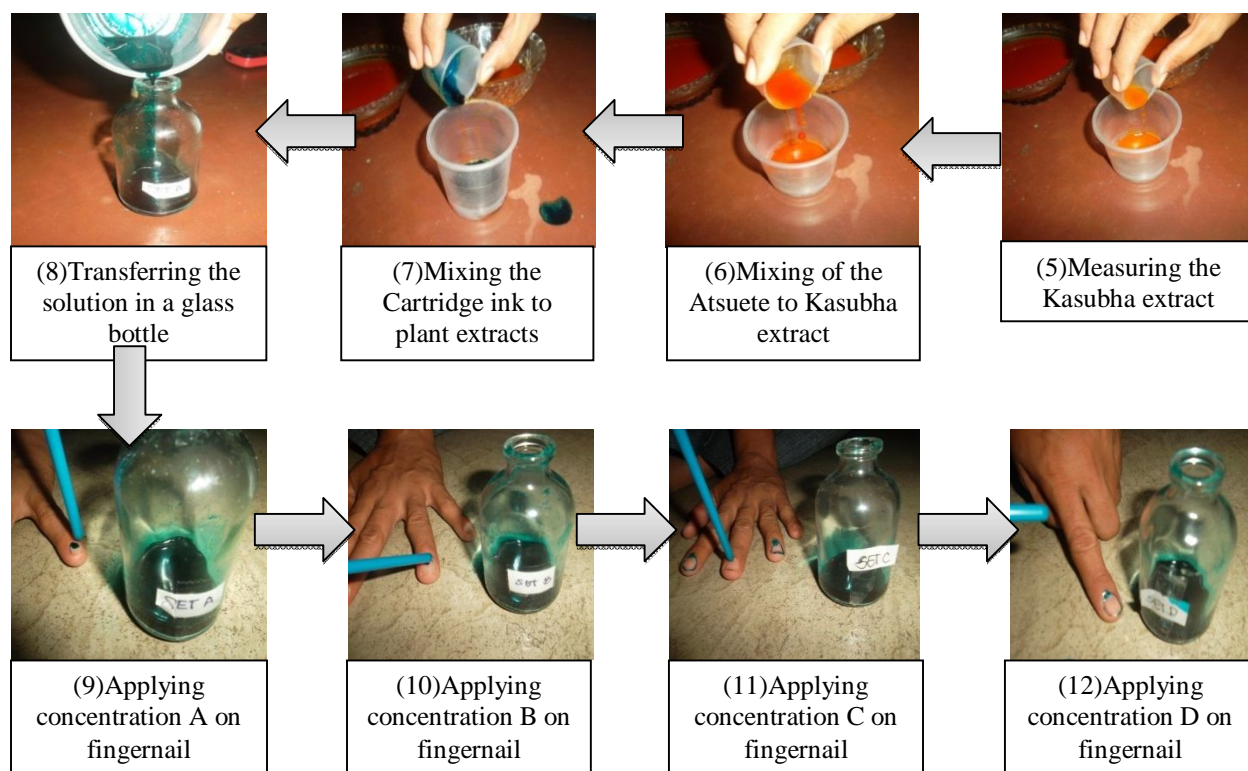
Table 1. Ratio of cartridge ink, kasubha and atsuetes extracts on each treatment.

Set up	Cartridge Ink (%)	Kasubha extract (%)	Atsuetes extract (%)
A	25	25	50
B	30	30	40
C	25	50	25
D	30	40	30
E	0	100	0
F	0	0	100

*Testing the Created Ink.* The created inks were tested to three different respondents by putting a drop of it to his/her fingernail. Days of adherence were determined by counting the number of days the ink adhered to the fingernail. Reaction of the ink to different medium was also determined by putting 1.5 mL of water, alcohol and acetone to the fingernail. The time, in seconds, it takes to erase the ink was noted using a stopwatch. Lastly, a visual quality rating (VQR) was done to determine the stability of the ink after applying to the fingernail. Below is the VQR used for the product.

Table 2. Visual quality rating for the stability of the ink on the fingernail.

Score	Description	Characteristic
5	Excellent	100% of the ink adheres on the fingernail
4	Very good	75% of the ink adheres on the fingernail
3	Good	50% of the ink adheres on the fingernail
2	Fair	25% of the ink adheres on the fingernail
1	Poor	0% of the ink adheres on the fingernail



## RESULTS AND DISCUSSION

### Days of Adherence

Extract from the four set ups were marked on the three respondents at the same time. This was done to observe what concentration will last longer on the fingernails. Results are shown in Table 3 and Figure 1.

Table 3. Days of adherence of the ink on the fingernail

Set ups			Days of Adherence			
Cartridge Ink	Kasubha Extract	Atsuete Extract	R1	R2	R3	AVE
25%	25%	50%	3	4	3	<b>3.33</b>
30%	30%	40%	5	5	5	<b>5.00</b>
25%	50%	25%	3	3	3	<b>3.00</b>
30%	40%	30%	4	4	4	<b>4.00</b>
0%	100%	0%	3	2	2	<b>2.33</b>
0%	0%	100%	3	3	3	<b>3.00</b>

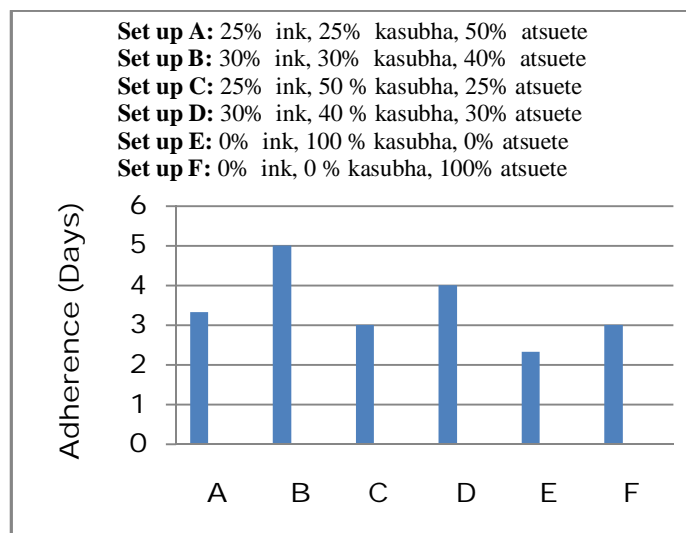


Figure 1. Days of Adherence of created inks using kasubha and atsuete extract and cartridge ink

Based on the results of the experiment, 25% of the cartridge ink, 25% of the kasubha extract and 50% of atsuete extract had an average of 3.33 days of

adherence. Concentration of 30% cartridge ink, 30% kasubha extract and 40% atsuet extract had an average of 5 days. Concentration of 25% cartridge ink, 50% kasubha extract and 25% atsuet extract had an average of 3 days and lastly, concentration of 30% cartridge ink, 40% kasubha extract and 30% atsuet extract had an average of 4 days. Solution with 100% Kasubha extract had an average of 2.33 days and 3 days for 100% astute extract. Comparing the six different set ups, the concentration that has 30% cartridge ink, 30% of kasubha extract and 40% of atsuet extract was the last to be removed on the fingernail while the solution of 100% kasubha extract was the first one to be removed. In these results, it shows that the higher the amount of atsuet seed extract, the longer the days that it would adhered.

### Reaction to Different Solutions

Three solutions were used to determine the reaction time of the ink namely water, acetone and alcohol. 50 mL of each solution was used to erase the ink on the finger nail of each of the three respondents. One finger per concentration is used. The results of the test are in table 4, 5 and 6.

Table 4. Reaction time of the water to the ink on the fingernail

Set ups			Reaction time of the water in seconds			
Cartridge Ink	Kasubha Extract	Atsuet Extract	R1	R2	R3	AVE
25%	25%	50%	17.29	56.37	53.94	<b>42.53</b>
30%	30%	40%	48.53	1:22.84	56.08	<b>62:48</b>
25%	50%	25%	23.51	27.10	48.53	<b>33.04</b>
30%	40%	30%	27.42	19.42	42.65	<b>29.83</b>
0%	100%	0%	9.76	8.25	10.12	<b>9.38</b>
0%	0%	100%	10.57	10.33	12.20	<b>11.03</b>

Table 5. Reaction time of the acetone to the ink on the fingernail

Set ups			Reaction time of the acetone in seconds			
Cartridge Ink	Kasubha Extract	Atsuet Extract	R1	R2	R3	AVE
25%	25%	50%	45.7	41.9	48.6	<b>45.40</b>
30%	30%	40%	1:07.9	52.6	1:04.5	<b>61:67</b>
25%	50%	25%	17.4	26.4	27.5	<b>23.77</b>
30%	40%	30%	34.9	25.4	37.3	<b>32.53</b>
0%	100%	0%	11.99	12.09	13.02	<b>12.37</b>
0%	0%	100%	13.76	14.03	15.03	<b>14.27</b>

Table 6. Reaction time of the alcohol to the ink on the fingernail

Set ups			Reaction time of the alcohol in seconds			
Cartridge Ink	Kasubha Extract	Atsuet Extract	R1	R2	R3	AVE
25%	25%	50%	23.6	18.7	18.1	<b>20.13</b>
30%	30%	40%	49.4	1:15.4	1:04.1	<b>1:02.96</b>
25%	50%	25%	39.8	32.7	38.4	<b>36.97</b>
30%	40%	30%	25.8	20	37.6	<b>27.80</b>
0%	100%	0%	17.9	16.01	18	<b>17.30</b>
0%	0%	100%	18	17.57	19	<b>18.19</b>

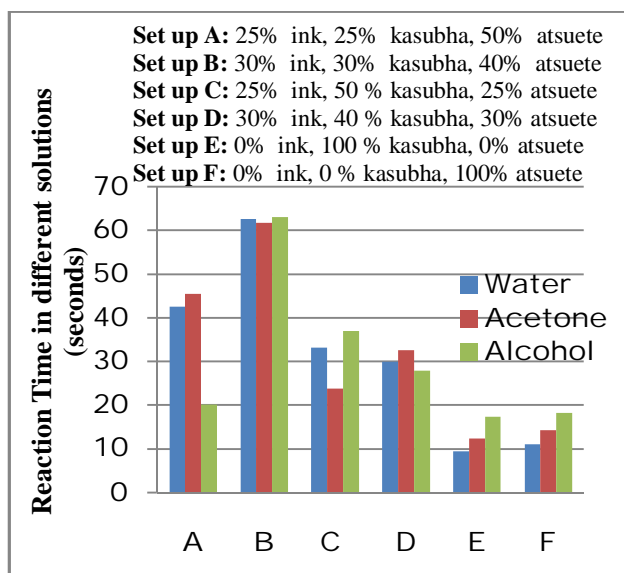


Figure 2. Reaction of the created ink to three different kinds of solutions

Based on the results, the concentration of 100% kasubha extract was the fastest to be removed with the average time of 9.38 seconds while the concentration of 30% cartridge ink, 30% kasubha extract and 40% atsue extract was the slowest to be removed in water. In using acetone, the concentration of 100% kasubha extract was the fastest to be removed while the concentration with 30% cartridge ink, 30% kasubha extract and 40% atsue extract was the slowest to remove on the fingernail. Lastly, in alcohol solution, the concentration that has 100% kasubha extract was the fastest to be removed while the slowest is the concentration that has 30% cartridge ink, 30% kasubha extract and 40% of atsue extract. Basically, the higher the amount of atsue seed extract, the longer the solution would take to remove the ink.

### Visual quality rating of the ink

The adherence of the ink of each set up was graded according to the amount of ink that adhered. The results are showed in figure 3 and table 5.

Table 7. The stability of the ink

Set ups			Stability			
Cartridge Ink	Kasubha Extract	Atsue Extract	R1	R2	R3	AVE.
25%	25%	50%	4	5	4	<b>4.33</b>
30%	30%	40%	5	5	4	<b>4.67</b>
25%	50%	25%	5	3	5	<b>4.33</b>
30%	40%	30%	5	4	5	<b>4.67</b>
0%	100%	0%	2	2	2	<b>2.0</b>
0%	0%	100%	3	3	2	<b>2.67</b>

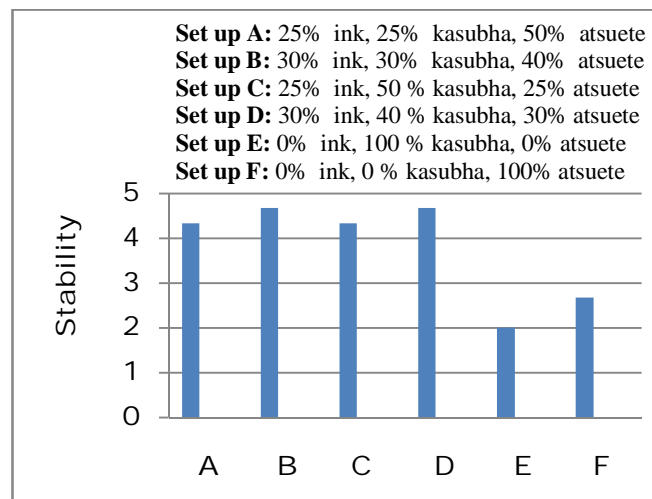


Figure 3. Stability of each concentration of the created ink

Based on the results, concentration of 100% kasubha extract has the lowest amount of ink that adhered. The higher the amount that adhere is concentration that has 30% cartridge ink, 30% kasubha extract and 40% atsue extract and concentration that has 30% cartridge ink, 40% kasubha extract and 30% atsue extract.

### CONCLUSION

This investigation involved the creation of indelible ink from atsue and kasubha extracts that is available at the market. The objective is to determine the feasibility of the alternative ink compared to the commercially ones sold in the market. It is also the purpose of this study to create a safe and cheap

indelible ink. There are four set ups and tested to three different experiments specifically, the days of adherence, reaction time to different kind of solutions and stability of the ink. From the data gathered, it was concluded that the ink from set up B that contains 30% cartridge ink, 30% kasubha extract and 40% atsute extract is the most effective and can be a potential alternative for indelible ink.

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