PREPARATION AND EVALUATION CARBON NANO KAJAL FROM NATURAL SOURCES

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ABSTRACT

1.INTRODUCTION

1.1 Herbal Medicine

Herbal medicine is the world's oldest type of healthcare. During olden times, herbs have been employed by all societies (1). Herbal medications are widely used. Any medicinal product that contains one or more active ingredients is defined as a medicinal product. The great majority of the world's population uses herbal medicines as sickness treatments (2). They are naturally occurring, plant-derived substances that are used to treat illnesses within local or regional healing practices. These products are complex mixtures of organic chemicals that may come from any raw or processed part of a plant. Herbal medicine has its origins in ancient cultures. It involves the medicinal use of plants to treat disease and enhance general health and wellbeing. WHO (World Health Organization) define Traditional herbal medicines as naturally occurring, plant-derived substances with minimal or no industrial processing that have been used to treat illness within local or regional healing practices.

Herbal medicine is still the mainstay of about 75 - 80% of the world population, mainly in the developing countries, for primary health care. This is primarily because of the general belief that herbal drugs are without any side effects besides being cheap and locally available.

1.2 Carbon Nanoparticles

Currently carbon based nanoparticles have expanded their consideration in many research fields because of their unique physical and chemical properties. Various carbon-derived nano materials such as fullerenes, carbon nanotubes (CNTs), graphitic nanofibers (GNFs), graphene etc. exhibit remarkable optical and electronic properties, which have been exploited for various applications such as optoelectronics, chemical sensing, biological labelling, etc. (3). It is most popular in medicine because biological processes also occur in the nanoscale. Carbon is plentiful elements observed in nature. The carbon nanoparticles having larger surface area, hence it is suitable for several kinds of formulation and developments. It has been found that carbon nanoparticles damage the membranes in bacteria due to an oxidative stress (4, 5). Maheshwar Sharon has also revealed that the soot of camphor is truly carbon nanotubes. Nanoparticles have long been used in cosmetics. In ancient India, black soot and mineral powders were used in cosmetic (6).

1.3 Eye Cosmetic

In cosmetic industry the eye makeup plays an essential role. This eye cosmetic includes eye shadow (applied on eye lids), mascara (applied on eye lashes), eye linear (applied on inner and outer corners of eyes), Eyebrow pencil (applied on eyebrow), under eye cream, and Kajal (applied on lower and upper waterline).

1.4 Kajal as ancient Nanomedicine

Traditionally Kajal is known as surma or kohl. Kajal is the cosmetic preparation applied to the eye for beautifying purpose as well as for protecting from evil eyes. Since ancient times various herbs, metals and non-metals preparations are used as medicine in Ayurveda. It is observed that the concepts of nanotechnology are comprised in thousand years old Ayurveda. In India, people usually utilize the nanotechnology in the form of Kajal which is around 2000 year's old technology. India has a unique celebration day when the first time kajal is applied to a child (6).

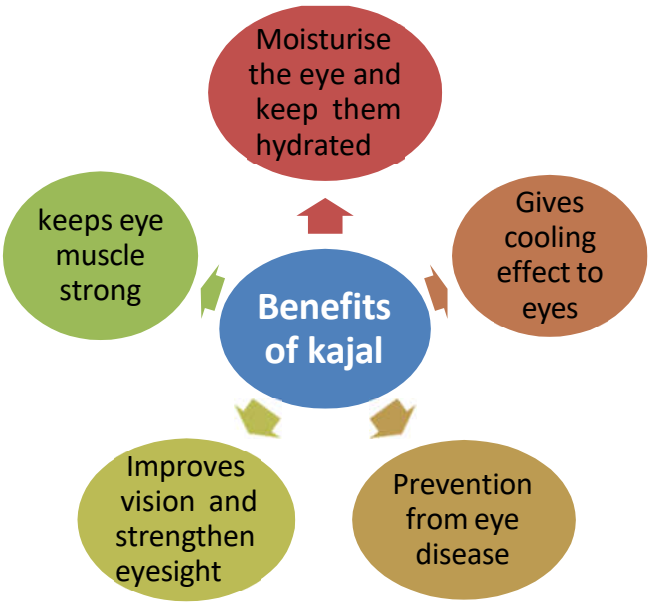


Fig no. 1 Benefits of Kajal formulation

1.5 Anatomy of eye

The eye is delicate organ made up of three layers which are enclosed with aqueous humour, lens, and vitreous body. The outermost region consists of the cornea and the sclera. The cornea and the sclera are connected at the limbus. The visible part of the sclera is covered by a transparent mucous membrane, the conjunctiva. The middle layer consists of the iris, the ciliary body and the choroid while the inner layer of the eye is the retina.

Cornea

The cornea is the most anterior part of the eye, in front of the iris and pupil. It is the most densely innervated tissue of the body, and most corneal nerves are sensory nerves, derived from the ophthalmic branch of the trigeminal nerve. The cornea of an adult human eye has a typical horizontal diameter of 11.5 mm, a typical vertical diameter of 10.5 mm, and a relatively constant curvature over the course of a lifetime. The main function of cornea is to refract and transmits the light to the lens and the retina additionally it protects the eye against infection and structural damage to the deeper parts.

Sclera

The sclera forms a connective tissue coat that protects the eye from internal and external forces and maintains its shape.

Iris

The iris controls the size of the pupil, and thus the amount of light reaching the retina.

Ciliary body

The ciliary body controls the power and shape of the lens and is the site of aqueous production

Choroid

Choroid is a vascular layer, the main function of choroid is to provides oxygen and nutrients to the outer retinal layers.

Retina

It is a complex, layered structure of neurons surrounding the vitreous cavity. Main function of retina is to capture and process light.

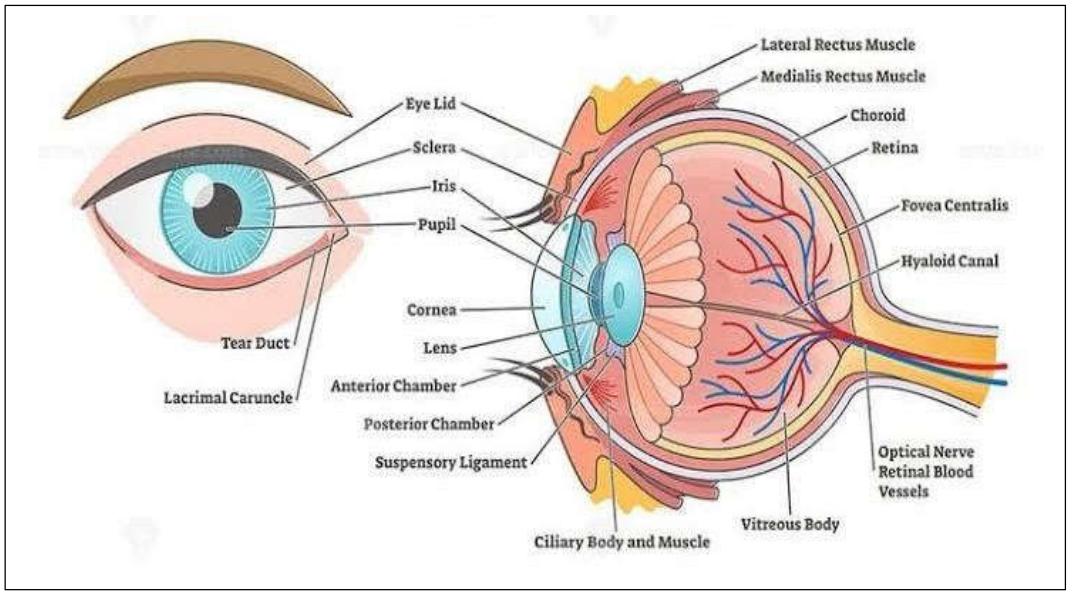


Fig no. 2 Anatomy of eye

1. LITERATURE REVIEW

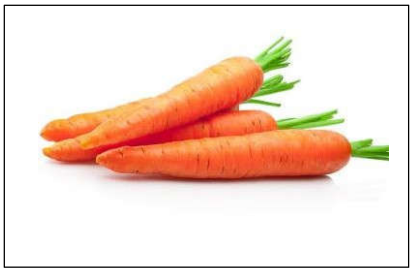


Fig no 3 *Daucus carota*

2.1 Daucus carota

Synonyms: Gajar, wild carrot, European wild carrot, bird's nest

Scientific classification

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Asterids

Order: Apiales

Family: Apiaceae

Genus: Daucus

Species: *D. carota*

Biological source: It consist of dried roots of *Daucus carota*

Family: Apiaceae

Chemical Constituents:

Carrots contain carotenes, especially alpha- and beta-carotenes, vitamin A and C, and dietary fiber. It is rich in calcium and potassium. Red carrots also contain lycopene.

Uses:

- Raw carrot & its juice are a good tonic for eyes, skin, physical & mental development.
- Carrot juice with two cups of milk & 5-6 almonds in the morning sharpens memory.
- Slices of raw carrot and beetroot with lemon juice sprinkled on it cures anaemia.
- Carrot paste applied on forehead & above the nostrils stops nose bleeding.
- Juice of carrot, beetroot & cucumber eliminates headache & cures rheumatism.
- Juice of carrot & spinach after meals cures constipation.
- Carrot is rich in vitamin A which is good for eyes.

2.2 *Azadirachta indica*

Synonyms: Neem, margosa, nimtree, Indian lilac

Scientific classification

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Rosids

Order: Sapindales

Family: Meliaceae

Genus: Azadirachta

Species: *A. indica*

Fig no 4 *Azadirachta indica*

Biological sources: It consists of dried leaves and leaflets of *Azadirachta indica.*

Family: Meliaceae

Chemical constituents:

The leaves contain nimbin, nimbinene, 6-desacetylnimbinene. nimbandiol, nimbolide. quercetin, P-sitosterol, ascorbic acid. n-hexacosanol, nonacosane and amino acids. The fatty acid composition of the oil is as:myristic (0.2%), palmitic, stearic, arachidic, oleic and linoleic (9%).

Uses:

- A super skin toner, can cure acne, pimples, eczema, skin rash etc
- Remove dandruff reduce hair fall and strengthen hair
- Can cure bad breathe, tooth ache, swollen gums etc
- Tones the digestive system & boost appetite.
- Reduce acidity and nourish the intestine.
- Purify the blood & improve immunity
- Natural insecticide and mosquito repellent.
- Having antimicrobial, antifungal, antiviral properties

2.3 *Aloe barbidensis*

Fig.5 *aloe barbidensis*

Synonym: Aloe, ghritkumari
Scientific classification:

Kingdom: Plantae

Clade: Tracheobionta

Clade: Spermatophyta

Clade: Magnoliophyta

Clade: Liliopsida

Clade: Liliidae

Order: Liliales

Family: Liliaceae

Genus: Aloe L

Species: Aloevera(L.) ,Aloe Barbadenis mill

Biology source: Dried juice collected by incision from the bases of leaves of various species of Aloe such as aloe Bardadensis, aloe spicata, aloe perryi, aloe Feroz.

Family: liliaceae.

Chemical constituents:

Leaves contain Lignin, saponins, anthraquinones, amino acid, enzymes, vitamins (A, B, C and E) , polysaccharides, minerals.

Uses:

- Aloe leave helps to prevent cancer.
- Boost immune system.
- Provide relief from side effects of radiotherapy done to treat cancer.
- Helps to reduce inflammation.
- Relieves pain caused by arthritis.
- Useful in treating skin ailments and dermatitis.
- Ensure proper functioning of digest system
- Having antiviral, antioxidant, antimicrobial properties.

Aim and objective

Aim: To prepare and evaluate carbon nano kajal from natural sources.

Objectives:

- Procurement and authentication of plants
- Phytochemical and physicochemical screening of crude drugs
- Collection of carbon filament.
- Characterization of carbon filament.
- Preparation Kajal from carbon filament and its Evaluation

2. Need of work:

Carbon nanoparticles are significantly fascinating topic in current era. There are several costly techniques were utilized for preparation of nanoparticle. In current research work cost effective method were employed for carbon nanoparticle collection. Several Kajal formulations were available in market but them having high cost. Additionally the current research proposes to work on two different carbon filaments collecting from herbal plants *Azadirachta indica* leaves and *Daucus carota* roots. By performing XRD study we will able to find out the difference between carbon filaments. In The current formulation we will incorporate several ingredients which are beneficial for eyes. The medicated herbal kajal will be the compact package with the goodness of Almond oil, vitamin E, glycerin, Aloe Vera and Ghee. Herbal Kajal is used to treat eye disorder, eliminate redness and beautifying the features of eye. Stable, pure, cost-effective and patient-friendly nature will be the main advantages of these products.

The proposed project will emphasize on identification of structural difference in carbon filaments collected from dried leaves of *Azadirachta indica* and dried roots of *Daucus carota and* preparing Kajal formulation from herbal ingredients.

3. PLAN OF WORK

- Collection and authentication of plants
- Morphological, microscopical, physical evaluation of crude drugs
- Phytochemical screening of crude drugs
- Collection of carbon filament from dried leaves of *Azadirachta indica* and dried roots of *Daucus carota.*
- Evaluation of carbon filaments
- Preparation of Kajal using carbon filament
- Evaluation of Kajal preparation

6. Material and methods

6.1 Collection and authentication of plant part:

All the required raw materials were collected from local market of Akluj. Tal.Malshiras, Dist.Solapur and all ingredients such as neem seed, neem leaves, carrot seed, carrot etc. are authenticated by department of Botany SM College, Akluj.

Crude drugs

Azadirachta indica and *Daucus carrota*

6.2 Morphological drug evaluation

The morphological charaterisctics of *Azadirachta indica* and *Daucus carrota* were examined and compared with data available at various search engines such as PubMed, Web of Science, Google Scholar, Embase, MEDLINE, etc.

6.3 Microscopical drug evaluation

The microscopical study of carrot root and neem leaves was carried out as per prescribed methods in official books.

6.4 Physical drug evaluation

The various physical evaluation such as ash value, extractive value, loss on drying, foreign organic matter was performed as per prescribed in ayurvedic Pharmacopeia.

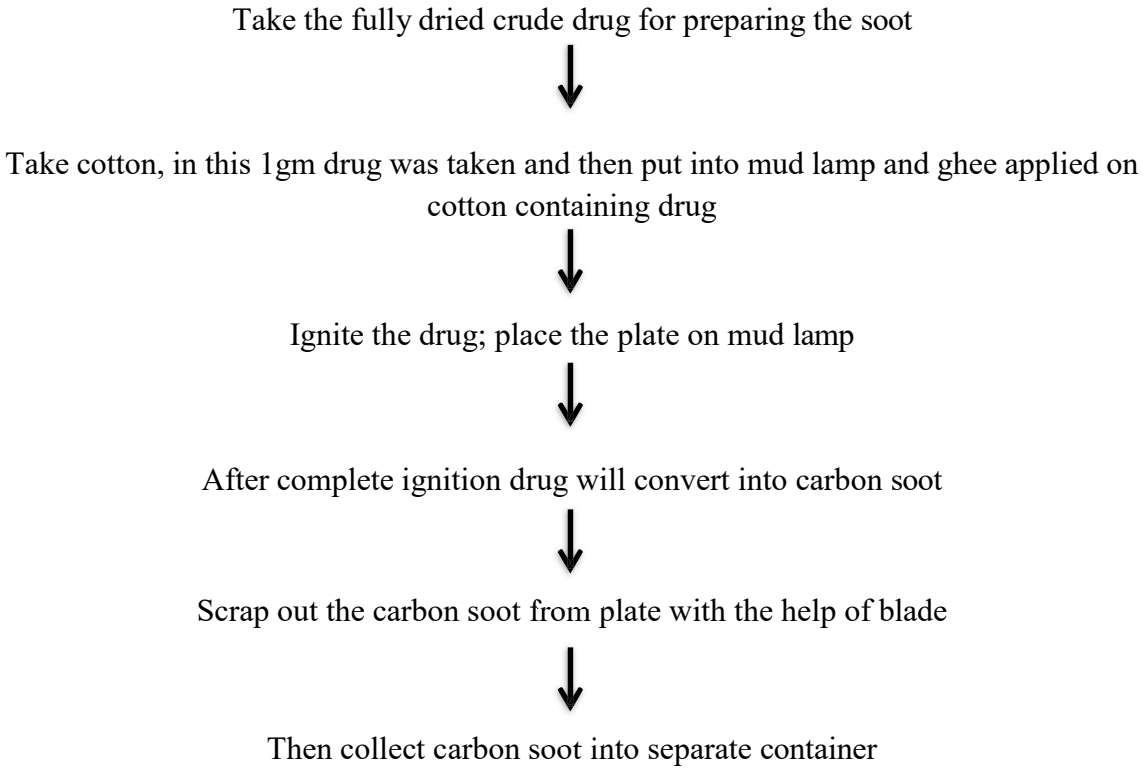
6.5 Chemical drug evaluation

The crude drugs were subjected to qualitative chemical analysis for identification of various plant constituents like alkaloids, glycosides, flavonoids, tannins, phenols, steroids and saponins by using different chemical tests.

6.6 Collection of carbon filament

Carbon filament was collected using dried leaves of *Azadirachta indica* and dried roots of *Daucus carrota.* Mud lamp, stainless steel plate, pure cotton, and ghee were used in this process of collection of soot. For collection of carbon filament two separate sets for *Azadirachta indica* and *Daucus carrota* were prepared.

Collection procedure



6.7 Evaluation of Carbon Filament

6.7.1 Modern methods

a. **Solubility:** The solubility of carbon filament was tested using various solvents.
b. **Ash value:** Ash value of carbon fillament was examine using method prescribed in official books
c. **Loss on drying:** Loss on drying was employed using hot air oven.
d. **Bulk density and Tapped density:** density of carbon filament was examining using tap density tester (electrolab).
e. **XRD:** Identification and characterization of compounds based on their diffraction pattern. Irradiating a sample of the material with incident X-rays and then measuring the intensities and scattering angles of the X-rays that are scattered by the material.

6.7.2 Ancient methods

a. **Fineness test (Rekhapurnata):** A pinch of carbon filament is rubbed in between thumb and Index finger. It conceals in the lines of finger and very smooth then this test is passed.
b. **Floating test (Varitara):** Clean water is taken in a glass and allowed to standstill. A pinch of carbon filament is sprinkled on the surface of water. It is observed that carbon filament float on the surface of the water.
c. **Unama:** This is continuation of the above test where in rice grain is placed on the surface of floating carbon filament. It is observed that, the rice grain still floats.
d. **Nishchandrata:** A pinch of carbon filament is taken and observed under bright sunlight.

6.8 Preparation of herbal kajal

Take a beeswax and lanolin melt together using water bath

↓

Then add carbon filament with aloevera gel

↓

Then add liquid paraffin and Glycerin

↓

Then add Vitamin E and Ghee

↓

And mix all the contents properly until become a uniform mixture. At the last add rose oil and propyl paraben as a preservative

↓

Pour this mixture into mold and place into refrigerator for 10 minutes to set the formulation

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After 10-20 minutes eliminate the stick from mold .then this stick positioned into the empty container

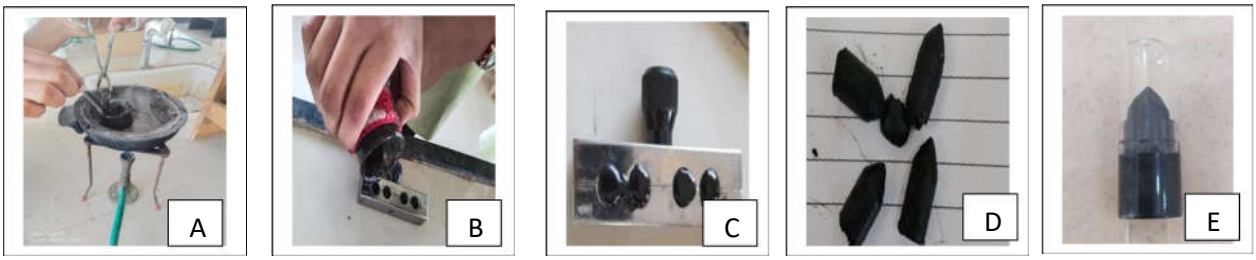


Fig no. 6 A, B, C, D and E indicates Method of preparation of Kajal

6.8.1 Formulation table

Table no. 1 Formulation and optimization of herbal kajal

Sr. no	Ingredients	F1	F2	F3	F4	F5	F6	F7	F8	F9
1	Beeswax(gm)	8	8	8	8	8	8	-	2	3
2	Lanolin(gm)	1	1	1.5	1.5	1.5	1.5	1.5	1.5	1.5
3	Liquid Paraffin(ml)	-	1	1	1	1	1	1	1	0.5
4	Vitamin E(mg)	400	400	400	400	400	400	400	400	400
5	Charcoal(mg)	100	100	100	100	100	100	100	150	400
6	Aloevera(ml)	-	-	-	1	2	2	3	3	3
7	Glycerin(ml)	-	-	-	-	0.1	0.1	0.1	0.1	0.1
8	Ghee(ml)	-	-	-	1	1	1	2	2	1.5
9	Rose oil(ml)	Q.S	Q.S	Q.S	Q.S	Q.S	Q.S	Q.S	Q.S	Q.S
10	Propyl paraben									

6. 9 Evaluation of formulation

a. Physical evaluation:

The formulations of medicated herbal kajal were evaluated for physical parameters like colour, odour, texture, consistency.

b. pH Determination:

The pH of prepared formulation is measured by a pH meter. 1gm of kajal sample was measured and dispersed in 25 ml of DMSO (Dimethyl sulfoxide).The pH value of kajal composition was recorded 3 times and average taken.

c. Spreadability:

To obtain a spreadability of kajal formulation take an excessive amount of kajal sample was taken on glass slide and the weight was placed on slides for 5 min. to press the kajal sample to the same thickness. Weight is added on pan. The time required for the split of two slides was taken a measure of spread.

Calculated using the formula:

$S = M.L/t$

Where,

M = the weight (g) tied to the upper glass slide

L = the length (cm) moved on slide

T = time to separate the slide.

d. Breaking Point Test :

This determines the strength of kajal. To carry out this test, the kajal is held horizontally in a socket fitting over about half inch of its base and weight is applied at measured distance from the edge of support .The weight applied is increased gradually every 30 sec. by predetermined increment (say 10 gms) until the kajal breaks. On a given lot, at least four readings should be made. The test should be made at a given temperature (25 °C or 30°C)

e. Droop Point Test :

The temperature at which the kajal started oozing out oil or flatten from within the case is known as droop point or yield point. Droop point should be above 50 °C for safe handling and storage.

f. Test For Penetrability:

This test specifies the rheological property of the kajal with the help of penetrometer. A needle of specific diameter is allowed to penetrate the kajal, and depth of penetration is noted.

g. Acid Value:

The acid value is to neutralize the free acid in 1 g of substance the number of mg of potassium hydroxide is required. Determined by the following method weigh accurately about 10 g of the substance in the 250 ml of conical flask and add 50 ml of alcohol and add 1ml phenolphthalein. Warm up on water bath if necessary until substance was dissolved. Titrate with 0.1 N potassium hydroxide. Shake constantly shake until pink colour is obtained. Note the number of ml required and calculate the acid value by using the formula:

Acid value = a x 0.00561 x 1000/W

Where, a= number of ml of 0.1 potassium hydroxide

Required

W= weight of g of substance taken.

h. Saponification value:

The saponification value is the number of mg of potassium hydroxide required to neutralized fatty acid determined by following method. Add 40 gm of potassium hydroxide in 20 ml water and add sufficient alcohol to make volume 1000ml. Allow it overnight. Weigh 4 g of ghee in 250 ml of conical flask add alcoholic solution of potassium hydroxide , attach to the reflux condenser set another reflux condenser as blank with other reagents. For hr. boil on water bath add 1 ml of phenolphthalein. Titrate with 0.5 N hydroxide acids. Note the number of ml required and calculate the saponification value by using the formula:

Saponification value = (b-a) x 28.05/W

Where, W= weight in g of substance taken

a= sample solution reading.

b=blank solution readin

7. RESULTS

7.1 Procurement and Authentication:

The herbs *Azadirachta indica* and *Daucus carota* procured and authenticated.

7.2 Morphological drug evaluation

7.2.1 Azadirachta Indica

Colour: - Slightly Yellowish Green

Odour: - Indistinct

Taste: - Bitter

Size: - Pinnate leaves are 15-25cm long

Shape: - Biconvex

7.2.2 Daucus carrota

Colour: - Orange

Odour: - Charaterisctic

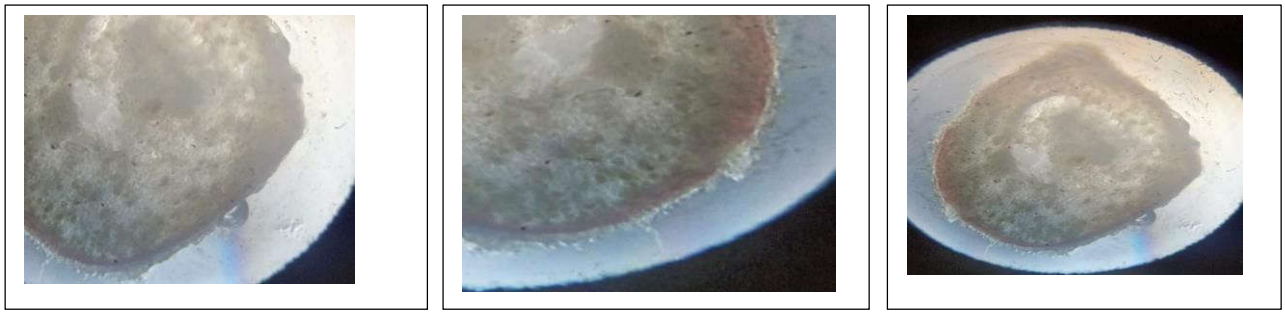
Taste:-Slightly sweet

Size: - 25cm long

Shape: - Spindle, cylindrical or conical

7.3 Microscopical drug evaluation

Fig no. 7 T.S of *Daucus carrota root*



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Physical drug evaluation

Fig no. 8 T.S of *Azadirachta Indica leaves*

7.4.1 Ash value

Table No.2 Ash value of A. indica and D. carota

Parameters	***Azadirachta indica***	***Daucus carota***
Total ash value	2 %	1.9 %
Acid-insoluble ash value	0.37%	0.69%
Water soluble ash value	0.79 %	1.02 %
Sulphated ash value	0.03 %	1.01%

7.4.2 Extractive value

Table No.3 Extractive value of A. indica and D. carota

Parameters	***Azadirachta indica***	***Daucus carota***
Alcohol soluble extractive value	8.8%	7.2%
Water soluble extractive value	5.6%	1. 6%
Chloroform soluble extractive value	6.4%	5.3%

7.4.2 Loss on drying and foreign organic matter

Table No. 4 LOD and foreign organic matter of A.indica and D. carota

Parameters	***Azadirachta indica***	***Daucus carota***
Foreign organic matter	0.00 %	0.00 %
Moisture content (LOD)	1.6 %	2 %

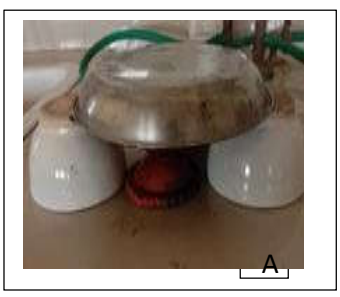
7.5 Chemical drug evaluation

Table No.5 Chemical drug evaluation of A.indica and D.carota

General chemical tests	***Azadirachta indica***	***Daucus carota***
Alkaloids	+	+
Glycosides	+	-
Tannins	+	+
Flavonoids	+	+
Steroids	+	+
Phenols	+	+
Sugars	+	+
Saponins	+	-

6.6 Collection of carbon filament

From *Azadirachta indica* and *Daucus carota* carbon filament were collected. 10 gm. of *Azadirachta indica* dried leaves gives around 3.1 gm. of carbon while 10 gm. of *Daucus carota* gives around 4 gm. of carbon.



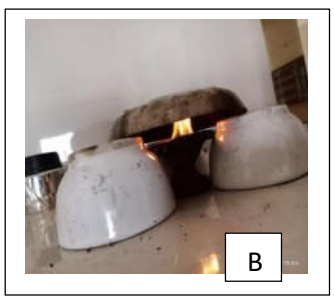


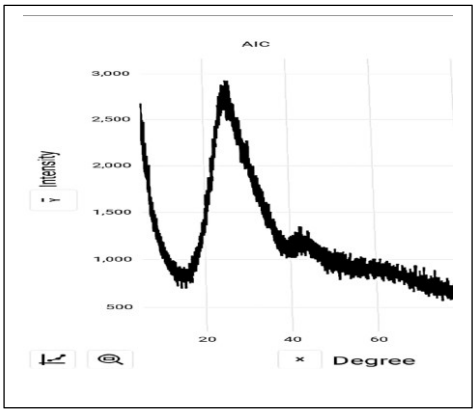
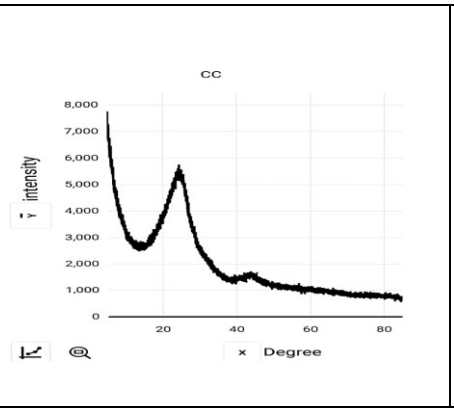
Fig no. 9 A & B indicates collection of carbon filament

Fig no. 10 collected carbon filament

6.7 Evaluation of carbon filament

7.7.1 Modern methods

Table No.6 Evaluation of carbon filament (Modern methods)

Test	***Azadirachta indica***	***Daucus carota***
ash value	0.12%	0.18%
LOD	0.06%	0.08%
Solubility in organic solvents	Insoluble	Insoluble
Bulk density	0.032	0.022
Tapped density	0.04	0.030
XRD	 **Fig no 11** XRD of *A. indica* carbon	 **Fig no 12** XRD of *D. carota* carbon

7.7.1 Ancient methods

Table No.7 Evaluation of carbon filament (Ancient methods)

Test	***Azadirachta indica***	***Daucus carota***
Fineness (Rekhapurnata)	Pass the test	Pass the test
Floating test(varitara)	Pass the test	Pass the test
Unama	Pass the test	Pass the test
Nishchandrata	Pass the test	Pass the test

7.8 Preparation of kajal

Nine formulations were prepared for each type of carbon filament *Azadirachta indica* (AIC) and *Daucus carota* (CC).

Fig no. 13 neem kajal

Fig no. 14 Carrot kajal

7.9.1 Evaluation of neem kajal

Table no.8 Evaluation of herbal kajal prepared from *Azadirachta indica*

Parameters	F1	F2	F3	F4	F5	F6	F7	F8	F9	Marketed formulation
Melting point	42°C	40°C	37°C	38°C	39°C	37°C	34°C	33°C	42°C	40°C
Free from grittiness	Free	free	free	free	free	Free	free	free	free	free
Acid value	46.3	53.1	48.0	49.2	53.5	50.9	51.1	54.2	55.15	50.5
Saponification value	220	232.3	219.7	229	244.4	230.1	243.8	223.2	224.4	280.5
Colour intensity	Good	Good	Good	Good	Good	Good	Good	Good	Excellent	Excellent
Stability	stable	stable	stable	stable	stable	Stable	stable	stable	stable	stable
Droop point	40°C	35°C	40°C	40°C	40°C	40°C	40°C	40°C	40°C	40°C
Penetrability	1.2	1	1	1.4	1.2	1.1	1.2	1.4	1.5	1.7
Spreadability	4.5	4.33	3.83	5	5	4.83	4.16	3.5	3	2.9

7.9.2 Evaluation of Carrot kajal

Table no. 9 Evaluation of herbal kajal prepared from *Daucus carota*

Parameters	F1	F2	F3	F4	F5	F6	F7	F8	F9	Marketed

										formulation
Melting point	40°C	40°C	40°C	40°C	40°C	40°C	40°C	40°C	43°C	40°C
Free from grittiness	Free	free	free	free	free	Free	free	free	free	free
Acid value	61.28	58.71	60.52	55.34	52.98	59.42	56.85	64.11	65.37	60.5
Saponification value	173.2	163.3	170.4	158.2	166	169.7	161.9	172.5	168.3	280.5
Colour intensity	Good	Good	Good	Good	Good	Good	Good	Good	Excellent	Excellent
Stability	stable	stable	stable	stable	stable	Stable	stable	stable	stable	stable
Droop point	40°C	45°C	40°C	40°C	40°C	40°C	40°C	40°C	40°C	40°C
Penetrability	1	1	1.4	1.3	1	1.2	0.9	0.9	1.1	1.7
Spreadability	5	3.66	3.33	3.83	4	5	3.33	4.16	3	2.9

8. DISCUSSION

In current research work, both *Azadirachta indica* and *Daucus carota* were screened for qualitative and quantitative estimation in order to standardize the plant materials. The ash values were significantly used to determine the quality and purity of a crude drug. Ash value determines the inorganic radicals like phosphates, carbonates, and silicates of sodium, potassium, magnesium, calcium, etc. present in crude drugs. The extractive values give an idea about suitable solvents for extraction. The carbon filaments collected using *Azadirachta indica* and *Daucus carota* show different structures, which were confirmed in the XRD study. Hence, it was confirmed that every carbon filament has a different crystalline structure depending on its source. The herbal kajal prepared using neem and carrot carbon filaments is

loaded with goodness from almond oil, vitamin E, glycerine, aloe vera, and ghee. Every ingredient present in the formulation has several benefits, such as almond oil, which is a rich source of vitamin E and has a soothing effect on the eye. Aloe vera maintains hydration and is excellently protective. Ghee is used to increase spreadability and penetrability. Neem serves as an antibacterial and antifungal agent; hence, formulations containing neem are ultimately loaded with this activity. Carrot is excellent for eye sight, and with this carrot kajal, there may be chances of vision improvement.

9. CONCLUSION

Herbal kajal is economical because many supplements contain active components. Herbal Kajal is used to treat eye disorders, eliminate redness, and beautify the features of the eye. Stable, pure, cost-effective, and patient-friendly nature will be the main advantages of these products. The ingredients used in herbal kajal, such as *Azadirachta indica*, *Daucus carota*, almond oil, vitamin E, glycerin, aloe vera, and ghee, have valuable effects in the treatment of eye disorders. At last, it can be concluded that this herbal kajal formulation has significant quality and effects. This formulation will serve as both a beautifying and protecting cosmetic.

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