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DEVELOPMENT AND EVALUVATION OFBETA VULGARIS STALK BASED HERBALLIPSTICK

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ABSTRACT

With the rising of consumer's awareness of the adverse effect of synthetic dye on human health, lipsticks are frequently utilized by females for beautifying their lips. Mostly lipsticks are proposed by emitted dye. Recent studies have done on lipstick unwell that they contain traces of lead and heavy metals which may cause serious illness even cancer and may be fatal for life. This research aim is to produce an organic lipstick using battalias which is obtained from beta vulgaris stalks which having many health benefiting pigments. I.e., leafy top green of beet plant, but they are underutilized by many peoples due to lack of knowledge. Formulated lipstick was further evaluated for its melting point value, pH,softening point, homogeneity, spread ability, skin irritation test. Formulated lipstick result shows that values are near to marketed lipstick.

KEYWORDS: Betalains, Beet stalk, Herbal cosmetics, Lipstick.

INTRODUCTION

General introduction

Beet root

Beet root is obtained from beet root plant scientifically known as *Beta vulgaris*. It is a short height shrub plant. Aboil et.al.[3] Beet root pH value is 7.0-8.0 which shows beet alkaline nature. Kale R.G.[53] It's mainly grown for its nutritional benefits, healthy juice & its naturally obtained red pigmented stain. It is known as chaukidar in India. In country like India beets were utilized as coloring food, salad, juice, pickle etc. kale RG Now in India it is mostly cultivated in several state Haryana, Maharashtra, Uttar Pradesh, west Bengal & Himachal Pradesh, due to presence of battalias mainly betacyanin's including betanin,

probation, iso-betanin & neo betanin & betaxanthins. Antiviral and antimicrobial activity has been observed in beet extract on E-coli and staphylococcus aureus. Neha et. Al.[44]

Betalainsis responsible for its deep reddish pigments which is mostly present in its root. Several studies had been already reported that beta lain has higher anti-inflammatory as well as anti-oxidant capabilities in-vitro. Brunet et. al[11] It ranks amongst top 10 most potent veg. with respect to its anti-oxidant quality. Parvin Mirmiran.[41] Beet is naturally & outstanding source of vitamins & minerals, which is present in appropriate amount into beet, it is rich source of phosphorus, Mg+, Cu+, Ca+, Na+, Fe+ vitamins A, B1, D2, B6. Chauhan et. Al.[57]

It is mostly cultivated for veg. & juice purpose in India. In form of powder, it's used as coloring purpose in Indian sweets,soups, curry, jellies & in making jam. Beets are popular for its natural pigments in food industry and also for its surprising healthiness benefits properties like anti-inflammatory,anti-anemic, antiviral, anticancer, antioxidant. Brunet et. Al.[11]

In world, India ranked 2nd position in growing veg. India cultivate around 20% of the worlds veg. Major cultivator of beets in India are H.P, Haryana, west Bengal, U.P & Maharashtra. It is grown throughout India, from hilly south- chilled north areas. Neha etal.[44]

Figure 1: Picture of beetroot.

Plant morphology

Root: It is a biennial plant having bulb swollen tap root of purplish- red color.

Stem: Stems are purplish- red color like as its root. Leaf' are simple & attached to its rootpart. Miraj Spied. [31]

Leaves: Leaves are green- reddish color having heart shape structure. They were having purplish- red veins. Mahan these et al.[29]

Flower: They are having arranged in 5 petals, having greenish- red color. They are small in size with 3-5mm in diameter.

Beets plants reached nearby 1-2 feet in height. Depending upon the cultivar form, its long petioles leaves might be pink, white, light green and have crimson red veins, broad deep-green in color succulent leaves. Spied Miraj.[31] Beet roots and its leaves had been utilized in the folk medicine for treating a wide-ranging variation of illnesses. They are used in wounds healing, laxative, in digestion and the blood related disorder. It is used an anti-oxidant, anti-fungal, anti-inflammatory, anti-hyperglycemic, anticancer and neuroprotective agent. Neha et al.[44]

Variety

Detroit dark red: This type of beet is dark in red in color having round shape root. Pulp is hard & deep red. Leaf's are green & tinted maroon in colour. Plant takes 80- 90 days to mature.

Crimson globe: This plant is having flat spherical shape root, red in colour. Its pulp is crimson red. Leafs are light green & moderate- large in shape.

Beet stalks are young and leafy tops of the `*Beta Vulgaris'* plant. Beet stalks tops contain various health-benefiting pigments, vit. mineral and antioxidants more than its taproot. Beet stalks are very low-calorie leafy-stalk. Beet root tops can be collected at any stage of plant development. They are best while the beets plants are young, stem are soft and tender for eating. Liliana Ceclu.[24] Beet root leaves are rich in containing carotenoids compared to its tubers part. Fact explains that carotenoids are stored in the chloroplasts of green plant parts, as a mixture of alpha & beta carotenes, lutein, βcryptoxanthin, zeaxanthin, neoxanthin, and violaxanthin. Chikkara et al.[34]

Fig. Picture of beet stalks.

Chemical composition

Beet root is comprised of several biologically active phyto-chemical containing betalain, polyphenols, nitrate, saponin, and flavonoids. They are also rich in minerals; calcium, manganese, potassium, iron, zinc and magnesium. Chikkara et al.[34]

Greenish leaves and stalks are a ideal feature in weight gaining, obesity problems and mass management, as they are usually lower in calories. The high amount of vit. A, K and C is essential for the production of a protein necessary for bone healthiness. Greenish leafy vegetables are a rich origin of iron and calcium for any diet. Leafy vegetables are utilized in combating chronic-ailment, like tumor, heart related illness and diabetes- malitus, as they have anti-inflammatory and anti-carcinogenic property. Beetroot leaves are used to reduce blood pressure. Pavokovic and Krsnik.[14]

The beet top are an outstanding origin of vitamin A, K, C and E, as well as minerals, which is helpful in treating several conditions and ailment such as iron deficiency and blood pressure, tumor, dandruff, gastric ulcers, renal illness, hepato-toxicity or bile ailments like jaundice, hepatitis, food poisoning, diarrhea or vomiting.Miraj Spide.[31]

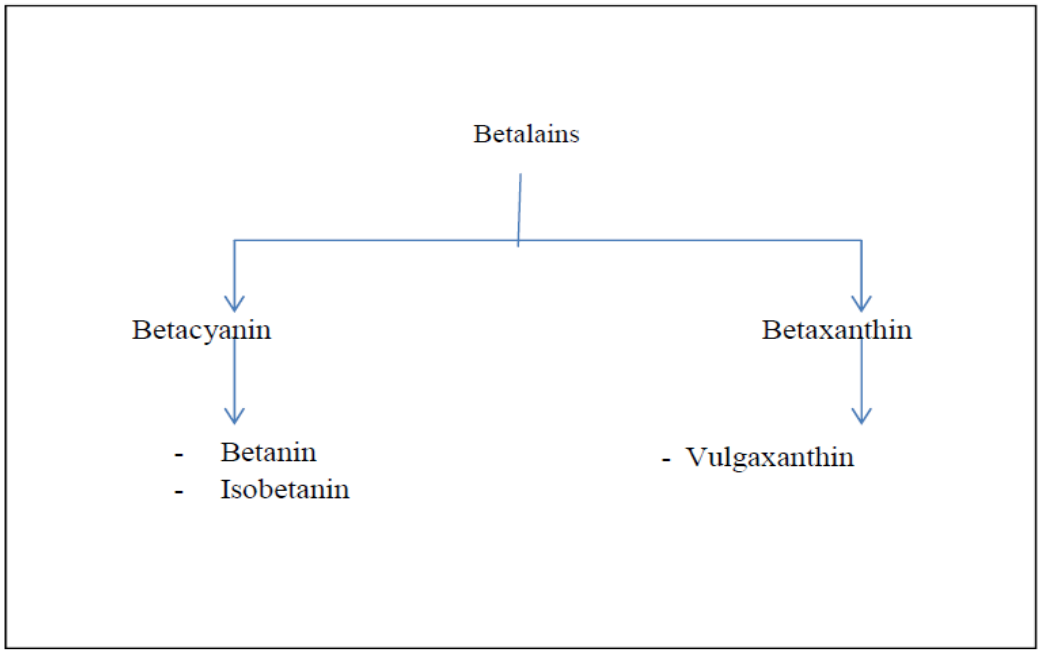

Fig.

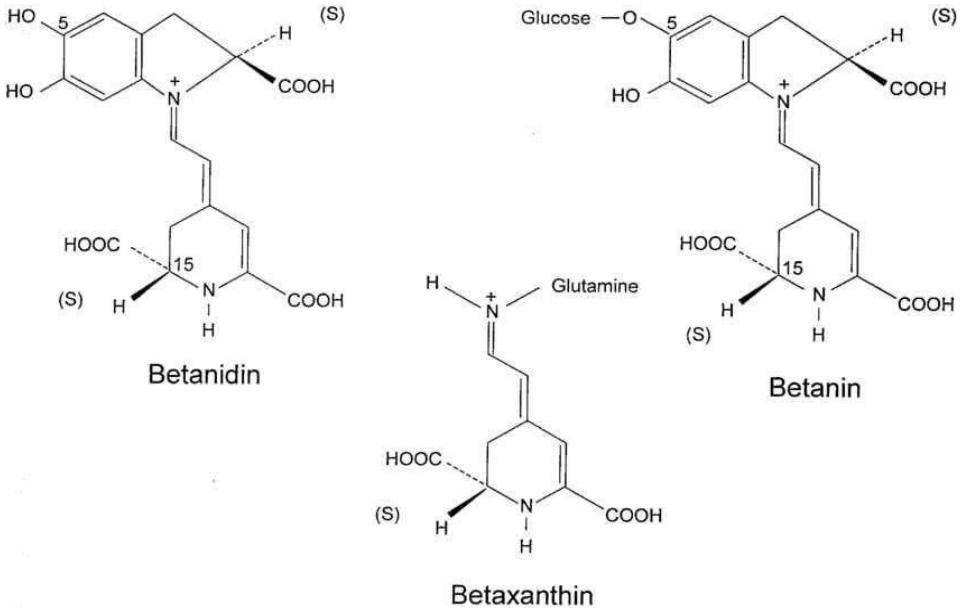

Fig. Structure of betanidin, Betanin and Betaxanthin.

Application of betalains

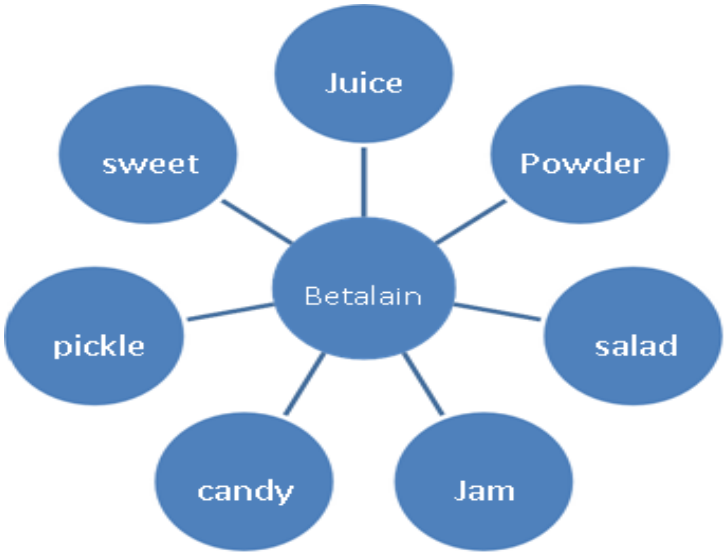

Fig. Diagram representing betalains application.

Beets healthy benefits

Liver detoxification: Scientist claim beet having chemical composition which helps in several ways such as liver detoxification, clean liver & improves its function.

High B.P: Consuming beet juice helps in lowering of B.P within 50-60 min.

Protect against birth defect: Vit. B folates are prescribed in pregnancy by doctor because they are necessary for fetus & brain developments. Beets prevent birth defectbecause it is rich in folic acid.

Anemia: For hemoglobin production our body requires iron which is profoundly present in beet root.

Cancer: Beet contains betacyanin as powerful antioxidant which is helpful in curing various cancers. Dr. Alexander ferenezi used raw beet and its juice for treating tumor successfully.

Constipation: Beets are having high content of fiber which is very helpful in constipation relief.

Eye: Beet juice contains retinol which helps in correcting vision, if taken regularly.

Heart: Beet contains various vit & minerals such as Mg+, K+, Na+, Zn+, and Cu+ which is helpful in protecting our hearts from any heart related disease. Medicinal plant pharmacognosy.com.[30]

Benefits of beet stalks

Beet stalks helps in boost blood health Beet stalks have much Fe than spinach; beet stalks upgrade blood by curing iron deficiency. Iron is a important part of hemoglobin, the substance present in RBC which transport O_2 from your lungs to our body.

Beet stalks helps in develop eye sight For increasing eye sights 'vit. A' and leutic is essential which is present in beet stalks.

Beet stalks in digestive health Beet stalks improve digestion and improve chronic constipation because of high fiber content.

Beet stalks give healthy teeth

Beet stalks are extraordinary in Ca^+, Mg^+, and Vit. D, it promotes strong teeth. Foods high in Ca^+ and Mg assistance build stronger enamel which prevents cavities.

Beet stalks helps in bones strengthening

Bone- osteoporosis can be prevented by providing energy to bone. Vegetable like beets stalks is good way to add on more Ca^+ to diet & build up bones because it is rich in Ca^+.

Support women pregnancy

Beet stalks gorgeous in Vit. B9, Folate which is required for both adults and infant. Folate is essential for securing health and baby's cells and tissues development.

Beet stalks uplift immune system

For raising immune system vit.C is very helpful & play important role in improving immunity for combat viruses. Vit.C is present in extraordinary amount in beet stalks.

Beet stalks helps in improve mental health

Beet stalks enclose high amounts of Vitamin B6 which recovers mood and boosts depression.

Beet stalks helps in lowering blood pressure

B.P can be reduced by uplifting blood health NO_3 is spectacular for raising O_2 level & unremarkably enhance heart functions.

Beet stalks build healthy skin

Beet stalks are filled with fibers which keep our skin clear and healthy. Arika Chilson[1]

Definition of cosmetic: - Cosmetic term is originated in Greek from the Greek word "**kosm tikas**" which means the potential, organize and skill in beautifying. Panda et. al[59] FDA states cosmeceutical as product "meant to be put onto the human body for washing, to make beautiful, upgrading charm, or modifying the look without influencing the body's structure or activities". Bhokare et.al[43] Cosmeceutical were discovered long ago & the origination was linked with various factors such as hunting of animals, superstitious beliefs, religious fact & fighting between communities & later it was also related to medical reason & also in medicine. **S**athesh and Yadav[25] Cosmetic are composed from a blend of chemical compounds resulting from either environmental sources or synthetic. Cosmetic is designed for skin care. Cosmetic is used for cleansing, exfoliating & for protection, besides refreshing it, through the usage of toner, serums, cleanser, moisturizing products & lip balms, cosmetics design for more over-all self-care such as shampoos & body-wash utilized to clean the body, cosmetic design to improve one's look or can be used to cover flaws, enhancing natural features, adding colors to a person's face & in the case of more extreme forms of makeup which is required for presentations, fashion shows & people costume, can be used to alter the look of face totally to look like a different person, creature or object. For adding fragrant to body cosmeceutical products can also be designed. Chaudhari et. al[37] smetics items are extensively used in day-day life. Cosmetics are mostly used for improving women's appearance. A lipstick is a commonly used cosmetic which is applied on lip surface for coloring as well as for protecting our lips surface fromdrying and cracking. Lipstick heigzhten look by coloring lips so they are high in demand in up-to-date market. Lipsticks are available

in 300 of shades for required customer's looks and still developing just to meet customer's satisfaction. Commonly used shades are pink, orange colour & red colour. Usually commercially available lipsticks color or shades is fabrication by artificial dye pigments. Consumer indigested lipsticks unintentionally which is dangerous for health because artificially made dyes are toxic andeven carcinogenic in nature. Artificial dye has coal tar as common ingredients which cause lip drying, dermatitis, nausea & even allergy, due to many opposing effect users chooses organic product over artificial products. Tan Yong Linn.[64]

Herbal cosmetic

Organic or natural cosmetics are well known as 'herbal cosmetics.' due to lack of adverse effect of organic cosmetics their demand is growing quickly**.** Bouidine et. Al.[8]

The term "herbal" actually means "organic" according to an estimate by the WHO aboutfour billion peoples around the world use herbal product for their prime skin care and health care. Herbal referred to products that are prepared from plants for their medicinal value. Singu et. Al.[62]

Present scenario of herbal product

Herbalists now a day believes to assist humans construct their appropriate fitness with theassist of herbal sources. Herbs are belief to be meals in preference to remedy due to the fact they may be absolutely herbal & pure. When we consume herbs, they help in purifying our body. Pandey and Meshya.[58] Chemically synthesize preparations includes fairly chemicalize components which produce many adverse effects. Herbal preparations include components which having numerous biological activities; anti- anemic anti- inflammatory antibacterial and antiviral. Gediya S.K.[60]

Difference between herbal Products and Synthetic products

Table difference between products. Joshi and Pawar[25]

S. N.	Herbal product	Synthetic products
1	They are obtained naturally	They are obtained synthetically.
2	Environmental friendly	Not environmental friendly
3	No allergic reaction	allergic reaction
4	No animal test	Tested on animal
5	Available in nature	Available in market
6	Safe to use	Not safe
7	Eg. Neem, aloe Vera, turmeric,lemon	Eg. Parabens, lead, dyes

The requirements for the basic skin carecleansers

These are the agents used for removing dust particles, skin dead cell and dirt which chokeour skin minute opening. Commonly used cleansers are coconut oil, almond oil etc. **Toners** Chaudhari et. Al.[37]

There are many herbs used for skin tightening and they also protect skin from toxic effect caused by environment and air pollution. Herbs utilize as toner are lemon, honey, and some essential oils.

Moisturizer

Moisturizers are important for healthy skin. Moisturizer keeps skin soft and glowing. There are many herbs which can be used for moisturizing effect. Example: aloe Vera rose water, glycerin, coconut oil. Vadaga A.K[67] Lips.

The 2 plump overlap adjoining mouth outlet. They are made by some muscle, skin & mucus membrane. Lip lacking of bone and structure. Lips are made of skin, muscles & mucus they doesn't has any bone or cartilage. The skin of lips is arranged in a layer due to presence of stratified squamous epithelium tissue. Chaudhari et. Al.[37]

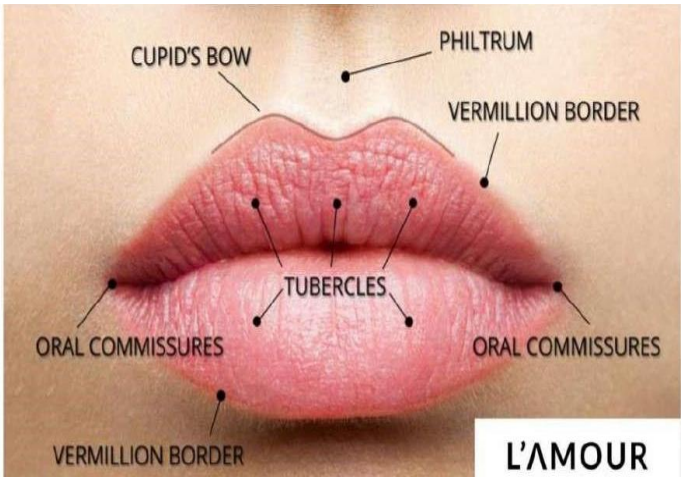

Fig. Lips and Its parts.

Lip Anatomy & Physiology

Our face skin is 15- 16 layer thicker than lips. Our lips tissues are translucent and having several capillary neighboring the lips surface which makes lips looking red in colour. There are 2 types of lips; 1. Labia superioris i.e. upper lips. 2. Labi inferioris i.e. lower lips. Lips have special property; there is no sebaceous gland, sweat gland & it is also barren of hair follicles. Both lips surfaces might be distinguished by surface of skin & itslining of mucous.

When both lip the upper & the lower lips come across, mark a transitionamongst lip vermilion & lips mucosal. Sathese and Yadav.[25]

Skin of our lip is easily broken in nature than other body skin parts. Our lips mucus occupied with some tiny capillary of bloods which is nearly close to lips translucent surface, gives reddish pink color to our skin. Sathese and Yadav.[25]

Lips histology

Labium superioris i.e. our upper portion of lip which extends fromnose base to nasolabial fold and also to the free edges of vermilion border. Labium inferioris i.e. our lower lips extend from superior vermillion- commissures laterally and -mandible. Our skin of lips is made by epidermis, subcutaneous tissue, orbicularis oris muscle fibers & mucus membrane. Our lip vermillion is made of keratinized squamous epithelium which envelope various capillary. Our lips inner skin is non- keratinized & consists of some stratified squamous epithelium. Our lip is made-up of stratified squamous epithelium, It is lips outer facing environment, but internal environment is made-up by stratified squamous non-keratinized epithelium. Lips vermilion border it is aborder among external & internal environment. Its influence by non- keratinized epithelium & it possess various artery which are nearby surface of our lips. Vagada.[67]

Herbal lip products available in market

Table2: Marketed lip products.

S. N	Lip product
1.	Lip balm
2.	Lip liner
3.	Lip gloss
4.	Lip plumper
5.	Lipstick

Herbal lip balm available in market

Table Marketed lip balms. Sakshi Bajapai[55]

S. no.	Lip balm	Brand
1.	Himalaya herbals strawberry shine lip care	Himalaya
2.	Lotus raspberry	Lotus
3.	Vaddi herbals strawberry lip balm	Vaddi
4.	Arata lip balm strawberry lip balm	Arata
5.	TNW beetroot herbal lip balm	TNW
6.	Forest essentials lip balm	Forest
7.	Khadi essentials wild rose lip butter	Khadi

Herbal lip plumper available in market

Table Marketed lip plumper's. Saraya Samaddar[56]

S. no.	Lip plumper	Brand
1.	NYX professional plump it up	NYX
2.	Seer secrets raw mango, paprika & mint lip plum	Seer secrets
3.	Duwop lip venom lip plumper	Duwop
4.	Too faced lip injection extreme lip gloss	Lip injection

Introduction of lipstick

Lipstick is a beauty enhancing cosmetic product; it is frequently used by women for theirlips, which gives nice colour and protection to the women lips. The basic ingredients of a lipstick are oil, wax, and colorant. . Karanje et. al[42] Waxes are added to a lipstick formulation to provide strength and structure to lipstick. Mostly, lipsticks are manufactured by synthetic and lake dyes like D&C, Red No.21, Orange No. 17, Red 7 and Red 34. The producers of synthetic dye are capable to provide synthetic dye with many choices of colours for lipstick preparation. Kruthika et al.[61]

A cosmetic like lipstick utilized for enhancing beautification. It is frequently utilize by female for lip, which gives beautiful shade tint & shield to women lips. The common familiar ingredient constituents of lip formulation are some-oils, some-waxes & pigment. Waxes are added to a lip formulation to provide strength and rigid shape to lip crayon.

Mostly lip formulations preparations are constructed by emitted & lake dyes. Pandey and Meshya.[58]

Fig. lipstick.

Characteristic of lipstick

Characteristic of lipstick are as follows:

- It must make our lips softer.

- It have to be non- drying
- It should be non- irritating to our lips skin. Pandit et al.[13] It must have pleasant odors & flavor.
- Lipstick should be free from sweating.
- It should ensure shiny & smooth appearance.
- It should be stable both physically & chemically. Chaudhari.[37] It should require long lasting effect.
- It should shield our lips adequately.
- It must have necessary plasticity.
- It should not dry during storage.
- It should be free from any gritty particle. Nema and Rathor[50]

Mechanism of lipstick

Swivelingmechanism of lipsticks includes:

Cup- for holding lipsticks.

Bullet nosepiece- contains cup & guide cup movement.

Spiral rotatable- connect to nosepiece detachable connected to cup.

Screw have double helical protrusion, formed on outer surface of screw double helical protrusion received in & guided by helical guiding groves inside spiral to make screw & cup move in both upward or downward direction when spiral is rotated. A.K Vadaga.[67]

Different types of Lipstick and Their uses

There are several categories of lip-sticks and they can be employed based on mood or outline of one's lips. They are given below:

Moisturizing lipsticks: Moisturizing lipstick contains aloe Vera, vitamin E and glycerin. It helps in keeping our lips smooth and soft. These types of lipstick are usedby people who have problem of dry lips.

Satin and Sheer lipsticks: Satin and sheer lipstick contains high oil ingredients, It helps in nourishing and moisturizing of lips, and also make sure its shine and gloss finish. They may look darker in its container than they are on lips.

Mate lipstick: Mate lipsticks have quality of showing-off non glossy and flat lips. When we apply matte lipstick our lips look smother and more young. Women who are looking for a

colorful and wonderful shade they can select Mate lipsticks. Chaudhari et. Al.[34]

Cream lipstick: Cream lipstick formulation contains more quantity of wax for lip protection, which may cause dry lips after effect, so we need to use lip gloss after thatfor desiring look. These lipsticks are smooth and non-shiny.

Pearl and Frosted lipstick: Pearl and frosted lipsticks are used for making lip sparkling. These lipsticks make our lips very sparkly by reflecting light. Before applying this type of lipsticks moisturize lip properly.

Gloss lipstick: These types of lipsticks are popular in girls having thin and small lips,because gloss lipstick makes our lip glossy and increase the dimension of depth.

Long lasting lipsticks: Long lasting lipstick is also acknowledged as Transfer Resistant Lipsticks. These lipsticks are used by women's who don't have time to apply lipstick repeatedly. Long lasting lipstick contains formulations which keep our look perfect for 4-8 hours. They may also contain moisturizing ingredients for balance lip dryness.

Waterproof lipsticks: These lipsticks having waterproof formula making productresistant to water. Vadga.[67]

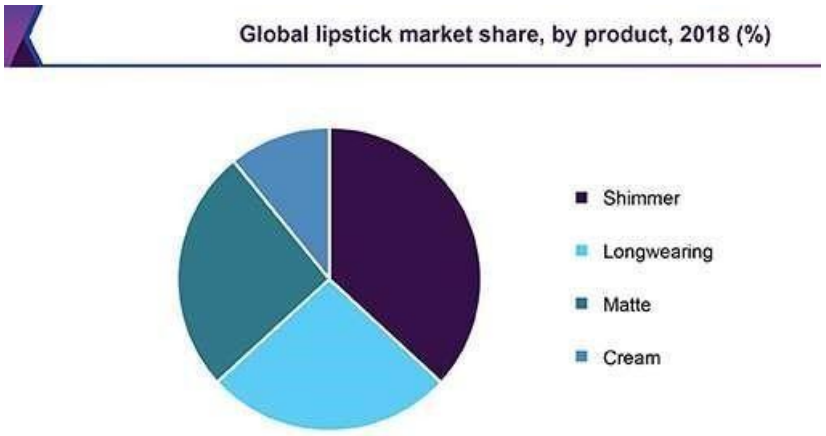

Figure 8: Pie chart representing lipstick demand.

Advantage of using lipstickbeauty

Lipstick is used to beautify women's lips and also boost their confidence level. Women'scan beautify themselves by coloring lips with bold shade, natural, nude and pastel shades.Lipstick makes women stand out look in crowd.

Moisturizer

Moisturization is necessary for our lips, without a moisturization lip becomes dry, flaky, dull and chapped. Lipstick contains some hydrating agent for providing moisture to the lips. E.g.: shea butter, cocoa butter, coconut oil, olive oil, argan oil.

Sunscreen Dalke et. al[17]

During 20th century some fashion artist and chemist observed that peoples are concern for protecting their face but not their lips while lips are more sensitive than face skin. So afterthat ingredients which protect from sun harmful rays are added to lipstick formulation.

Posture

Now numerous studies proved that women have better posture that used to apply lipstickdaily. Dalke et. Al.[17]

Table marketed herbal formulation available in india.

S. N.	Brand	Type	Shade available
1	Ruby's organics	Semi-matte	9 shade
2	Soultree	Creamy	24 shade
3	Barva skin therapie	Creamy	16 shade
4	Just herbs	Moisturize	16 shade
5	Forest essentials	Moisturize	3 shade
6	Iba halal pure lips	Moisturize	22 shade
7	Disguise cosmetics	Satin-matte	22 shade
8	My Glamm LIT	Satin-matte	14 shade
9	Earth rhythm lip & cheek tint	Moisturize	3 shade
10	Daughter Earth lip & cheektint	Moisturize	12 shade

OBJECTIVE AND SCOPE OF STUDY

Objective

Herbal lipstick is gaining more popularity due to their safe use over chemical lipstick, chemical lipstick cause many mild to moderate even sever adverse effects on long term use. Hence a study on formulation and evaluation of organic lipstick was a principal objective. The following are the main consideration in the research work:

1. To develop a colored extract from beet stalk.
2. To develop a formulation with extracted colour and other ingredients.
3. To formulate an organic lipstick this should have minimum or no side effects.
4. To evaluate prepared formulation.

To fulfill these objectives, I choose this topic.

Scope of study

The scope of present study was to utilize betalain pigment as colouring option, which is obtained from beet plant waste material i.e. beet greens.

Methodology and Work plan

List of Materials and Equipment

Raw Material and Chemical

Table list of material used in formulation.

S. no.	Material	Specification
1.	Bees wax	SD fine
2.	Paraffin wax	SD fine
3.	Shea butter	-
4.	Sunflower oil	Patanjali
5.	Coconut oil	Parachute
6	Aloe Vera gel	Patanjali
7.	Rose hip powder	-
8.	Pigment	Beet
9.	Chocolate essence	

Apparatus Equipment and Instrument

Table list of Apparatus and Instruments

S. no.	Apparatus	Specification
1.	Melting point	AMTECH INDIA, India
2.	Digital pH meter	Ei -112, India
3.	Hot air oven	SELEC
4.	Water bath	OMEGA INDIA, India
5.	Hot plate with magnetic stirrer	LASIN

Research methodology

This research was divided into 3 parts: 1. Extraction of beet root pigments. 2. Formulation of organic lipsticks with natural components. 3. Evaluation of formulated organic lipsticks.

In the first part, the color was extracted from shade dried beet stalks by using mortar and pestal. Extraction was attained by pouring, filtering & evaporating onto water bath. In 2ndpart of this research study organic lipsticks was formulated by using two waxes: bees wax, paraffin wax, two oils: coconut oil, sunflower oil, butter, rose hip powder, pigments,aloe Vera and vanilla essence as flavoring agents. Lastly formulation organic lipsticks was evaluated for melting point, softening point, pH, breaking point, smear test, homogeneity test, grittiness test, aging stability, skin irritation, surface anomalies and compare with marketed lipsticks blue heaven.

Experiment procedure

Extraction

Firstly wash beet green with water and keep it aside for drying water. Then take mortar & pestal and crush beet stalks into it, then extract color by using chloroform, repeat thisprocess 3-4 times. Allow to filter filtrate through filter paper, collect filtrate in a conical flask. Then transfer the filtrate in petri dish. Now place petri dish on water bath for evaporation, after evaporation collect coloring material & keep it in plastic bag for furtheruse. Dalpati et. Al.[38]

Identification test for beet root

To the pigmented extract, add-on some drops to diethyl ether which on reaction providesviolet colour that chances to yellow. Rasheed et. Al.[39]

Fig. Grinding of beet stalk.

Fig. Extraction of pigment.

Lipstick formulation

Organic lipstick was formulated by betalain stain which was extracted from beet stalk was based on formula as shown below in table 6. Organic lipstick was prepared by melting bees wax, paraffin wax, on water bath in porcelain dish. Then mix beet stalk extracted color, rose hip powder and sunflower oil and coconut oil and heat, then mix both phase at same temp. Aloe Vera gel & vanilla essence were added at 48℃. Then mixture was poured into lipstick mold & left until solidify. Ninfali and Anglino.[45]

Table formula of lipstick

S. no.	Material	Quantity
1.	Bees wax	4g
2.	Paraffin wax	4g
3.	Butter	2g
4.	Sunflower oil	6ml
5.	Coconut oil	6.5ml
6	Aloe Vera gel	2g
7.	Rose hip powder	1.5 g
8.	Pigment	Beet
9.	vanilla essence	7 drops

Fig. Heating of oils.

Fig. Mixing of Oil and Pigment

Fig. Formulated organic lipstick.

Evaluation

Evaluation of lipstick

Color

Detection of lipstick particular shade is important for buyer's acceptance. Formulated product color shade was visually determined in proper day light. Panda et. Al.[59]

Softening point

An organic lipstick must tolerate the range of situations to which it will expose in the users purse. Softening point of lipstick range is from 50 to 55℃. Jagtap et. Al.[69]

Method used are

1. Ring and Ball method

It is useful in finding the S.P of organic lipstick. The organic lipstick was inserted into a ring; extra mass is removed from upper and lower side using a blade, leaving lipstick like a tablet. Then for 10 min place it in refrigerator. Further ring was tied on a stand. On room temp. Place a beaker having 500ml of water on a hot plate with a magnetic stirrer. Then take a steel ball and place it on the tablet of lipstick, then implant it in the beaker till submerges. Start heating and slowly agitate. By using thermometer monitor the temperature. The temprature at which steel ball falls to beakers bottom was noted as lipstick S.P. Chikkara et. Al.[34]

2. Second method

Cut lipstick 1-2 inch tablet size, place this tablet into test tube and place a thermometer above the tablet & heat this setup. Note down temperature at which lipstick start deforming its shape. N.Chavan et. Al.[51]

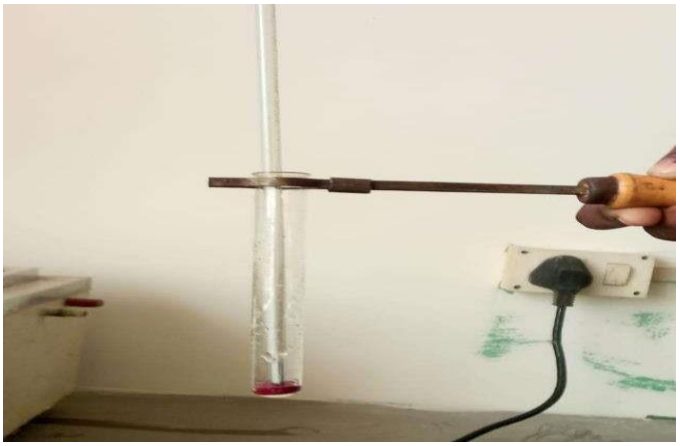

Fig. Softening point evaluation.

Surface anomalies

This test was studied for surface defect like crystal formation on surface, mold contamination, wrinkle formation, oozing out liquid & solid fatty substance and fungi. Dalpati et. Al.[38]

PH test

Formulated herbal lipstick pH was determined by using pH meter. Dissolve organic lipstick in 50ml of distilled water. Juma et. Al.[40]

Fig. pH evaluation test.

Skin irritation test

This test was performed by apply the formulated lipstick on skin surface, for about 10 min and observe the result. It is done for determining any skin irritation, either it is suitable for use by the consumer. Mayuri Kadu.[28]

Breaking point

It is done for determine the strength of lipstick. The lipstick is held horizontally in a socket ½ inch away from the support edge. Gradually increase weight at specific interval of 30 second and weight. When product breaks it is considered as breaking point. Dalvi et. al

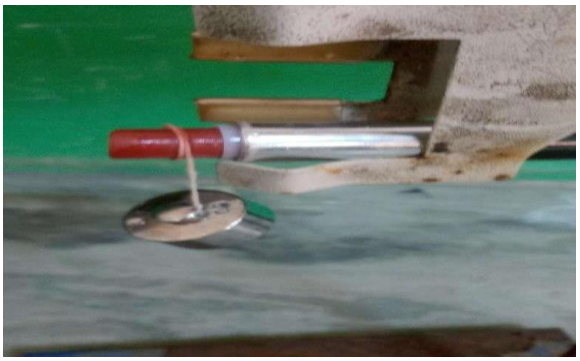

Figure 18: Breaking point of formulated organic lipstick.

Formulated organic lipsticks were stored at temp. of 40℃ in refrigerator, at temp. of 20-25℃ in room and at temp. of 30-40℃ for one hour. Various parameters like bleeding, streaking, cratering and blooming were observed. Maru and Lahoti.[7]

Homogeneity test

Test was done by applying certain amount of formulated lipstick on a transparent glass. It will show uniform arrangement & the no. of visible coarse grains. Setyawaty and Pratma.[52]

Fig. homogeneity of formulated organic lipstick.

Smear test

This test is done by applying the lipstick on the back side of hand then observes the no. of colors attached after 5 time's application. It is done for noticing no. of color shade attached to surface of skin. Susmaiatum et. Al.[63]

Perfume stability

The formulated herbal lipsticks were tested after 30 days, for recording fragrance of the lipstick. Dhakal et. Al.[32]

Test for spread ability

It was determined by spreading formulation at room temperature on glass again and again for detection of homogeneousness protective layer and also deformation of prepared lipstick throughout application. Nayak et. Al. [49]

Fig. Spreadability evaluation.

Melting point

Melting point of formulated lipstick was determined by capillary tube method; the capillary was filled and keep in the capillary apparatus. Point at which the product starts melting is noted. Bornare et. Al.[3]

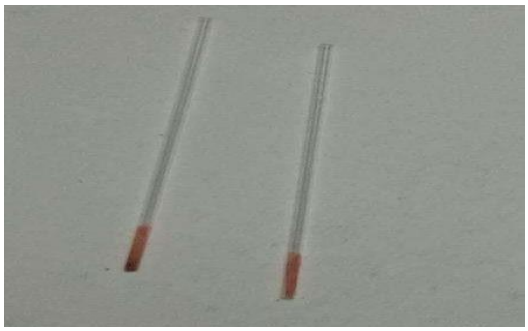

Fig. Capillary filled lipstick.

Fig. M.P of formulated lipstick.

Solubility test

Preparation was observed for solubility in different chemicals such as C_3H_6O, C_6H_6,, $CHCL_3$. C_2H_5OH. Agarwal et. Al.[26]

Fig. Solubility of formulated lipstick.

Analysis of evaluation data

Result and Discussion Color of Lipstick

Color determination is very important because color play important role in lipstick, it help to attract buyers. It is determined during day time in light & color was found beige-- brown.

Texture was found to be smooth. Observed result is show in table 12.

Table Representing result based on visual observation.

S. no.	Test	Result
1.	Color	Beige -Brown
2.	Texture	Smooth
3.	Surface anomalies	No
4.	Homogeneity	Homogenous
5.	Spread ability	Good
6.	Aging stability	Smooth
7.	solubility	Chloroform and benzene

Homogeneity

This test is done for uniformity of formulated product ingredient. This test result confirmed that formulation was mixed equivalently, any coarse-grain is not present within the formulation, and on application it will not rise to any lip sore and uniformly apply color to lips.

Surface anomalies

There is no surface anomalies present in formulation.

Test for spread ability

It was determined by spreading formulation at room temperature on glass again and again for detection of homogeneousness protective layer and also deformation of prepared lipstick throughout application. Spread ability of formulated lipstick was found to be good.

Aging stability

Sweating occurs due to presence of high oil content within preparation**.**

Solubility test

Resulted preparation was observed for solubility in different chemicals such as C_3H_6O, C_6H_6, and CHCL3. C_2H_5OH. Formulated preparation was found to be soluble in ethanol,$CHCL_3$ and C_6H_6.

Table Representing result based on evaluator observation.

S. no.	Evaluation group 1	Evaluator group 2
1.	No color	No color
2.	No irritation	No irritation
3.	+	++

Smear tests

This test was determined visually on hand back side after 5× application. It is done for noticing no. of color shade attached to surface of skin. Result was found to be there is no color attached may be due to low amount of pigment utilized with the preparation of lipstick.

Skin irritation

It is done for determining any skin irritation, either it is suitable for use by the consumer.This was performed by applying the formulated lipstick on skin surface. Product were applied on behind ear and elbow of few respondent with different skin condition such as normal & sensitive, because there skin parts are more sensitive than our other body parts. There is no irritation of skin found due to presence of all organic compounds utilized in formulating product.

Perfume stability

Determination of scent was done by evaluator group having 2 persons in each, they scorein + sign.

Table Representing result based on apparatus.

S. no.	Test	Result
1.	Breaking point	110gm
2.	Melting point	65℃
3.	pH	5.26
4.	Softening point	21-30

Melting point

Determination of Melting point is imp. As it is an indicator of the limit of safe storage. Melting point is indication of safe storage commercial lipstick was taken as standard melting value & it was found to be 62 while the manufactured product melting point observed is 64. Result shows that lipstick archives the requirement of storage of safe limit.

Breaking point

This test was done for determining the strength of lipstick. Breaking point of commercial lipstick is 80g while breaking point of manufacture product was observe to be 110 i.e. slightly greater than the boiling point value of commercial lipstick. As waxoil ratio rise, hardness of prepared lip-stick will also rise. Manufacture product breaking point were fall in limit of 105-110g.

Softening point

An organic lipstick must withstand the range of situations to which it will subjected in the users purse. It should be resistant to varying temp. Condition and be just as easy to apply in hot as well as in cold weather. Softening point was found to be 55℃ Lipstick formulation should have good balance among all ingredients items for succeeding ideal softening point softening point under limit.

pH

The observation of the pH is aimed to find out how much pH lipstick of each formula so that the safety of lipstick is known to be used on the skin. PH of prepared formulation was found to be 5.2. The result of pH value is included in the normal pH range of humanskin that is 4-6 its shows that it is safe for use.

CONCLUSION

The herbal lipstick is used for maintain the elasticity of skin, improve skin blood circulation. Benefit of organic lipsticks is they are non -toxic in nature, it supply vital nourishment to our lips. Regular uses of organic lipstick improve lip texture & color. In huge amount we need herbal lipstick to fulfill worlds growing lipstick market. So it is effective attempt of formulating herbal lipstick containing natural colorant of beet greens. All parameters such as melting point, boiling point, softening point were evaluated successfully. Result of formulated product was almost near to marketed product standard value. Overall, it was observed that betalains obtained from beet leaves is potential colorant alternative for coloring

purpose & it can be replaced by harmful synthetic dyes.

Table Representing comparison of formulated, Marketed and Standard lipstick value.

S. no.	Test	OrganicLipstick	Marketed Product	Std. Value
1.	Color	Brownish	Red	-
2.	Texture	Smooth	Smooth	Smooth
3.	Surface anomalies	No	No	No
4.	Homogeneity	Homogenous	Homogenous	Homogenous
5.	Breaking point	110 g	80 g	-
6.	Spreadability	Good	Excellent	Excellent
7.	Melting point	64-65℃	60-62℃	60-66℃
8.	pH	5.2	5.3	6.4
9.	Skin irritation test	No	No	No
10.	Softening point	55℃	52℃	50-60℃
11.	solubility	Ethanol benzene	Ethanol	-
12.	Perfume stability	++	+++	+++

Recommendations for future work

Since beet stalk also have betalain pigment it should be used as colorant.

Beet stalk should be considered for utilization because its also have many beneficial elements.

REFERANCE

1. Aarika Chilson. “Incredible health benefits of beet stalks.” https://www.justbeetit.com/beet-blog-index/10-incredible-health-benefits-of-beetstalks
2. Abhijeet A. Aher, Shripad, M. Bairagi, Preeti T.K Adaskar, Swapnil S. Desai, Pradeep K. Nimase. “Formulation and evaluation of herbal lipstick from color pigments of *Bixa Orellana* (Bixaceae) seeds. *International Journal of pharmacy and pharmaceutical sciences*, 2012; 4, 5: 357-359.
3. Aboli Bornare, Tejasvi Tribhuwan, Aishwarya Shinde and Swati Tarkase.” Formulationand evaluation of herbal lipstick.” *International Journal of creative research*, 2020; 8, 9: 2390-2394.
4. Agritechtnau:[online]available: https://agritech.tnau.ac,in/tnaupressnotes/pdf/potatobeetroot.pdf
5. Arashmeet Kaur, Thakur Gurjeet Singh, Sania Dhiman, Sandeep Arora & Kitchu Babbar “Novel Herbs Used In Cosmetics for Skin and Hair Care: A Review.” *PlantArchives*, 2020; 20, 1: 3784-3793.

6. Asrul Afandi, Azwan Mal Lazim, Azwanida Nn, Mumtaz Abu Bakar, Othman B Airianah and Shazrul Fazry. "Antibacterial properties in lipstick formulation against grame +ve and –ve bacteria." *Malays application biological*, 2017; 46, 2: 28-34.
7. Avish D. Maru and Swaroop R. Lahoti. "Fomulation and evaluation of lipstick containing sunflower wax." *International journal of pharmaceutical research*, 2018; 10, 3: 126-130.
8. Bouidin AS: Social science medicine, 1999; 49: 279-289.
9. Britannica [online] available: https://www.britannica.com/science/lips.
10. B.V Samlafo. "Awareness levels of possible health hazards associated with wearing of lipsticks among female students at university of education, winneba," *Ghana. International Journal advances in social sciences and humanities*, 2016; *4*, *4*: 54-60.
11. Canadanovic J.M Brunet, S.S Savatovie., G.S Cetkovic., J.J Vulic., S.M Djilas., S.L Markov., D.D Cvetkovic. "Antioxidant and antimicrobial activities of beet root pomace extracts." *Czech J. Food science*, 24(6): 575-585.
12. Danijela Seremet, Ksenija Durgo, Stela Jekic, Ana Hudek, Aleksandra Vojvodic Cebin, Ana Mandura, Jasna Jurasovic and Drazenka Komes "Valorization of banana and red beet root peels: determination of basic macrocomponentcomposition, application of novel extraction methodology and assessment of biological activity invitro." *Sustainability*, 2020; 12: 1-21.
13. Deepika Pandit, Aditi Gujrati, S.K Rathore. "Formulation and Evaluation of Herbal Lipstick from the Extract of Papaya." International journal of pharmaceutical sciences review and research, 2020; 6, 3: 107-110.
14. D.Pavokovic and M.R Krsnik."Complex Biochemistry and Biotechnological Production of Betalains." Food technology and biotechnology, 2011; 49: 145-155.
15. EI gamal AA, AL Said MS, Raish M, al-Sonaibani M, Al-Massarni Sm, Ahmad. "A Beet root (Beta Vulgaris) extract ameliorates gentamium-induces nephrotoxicity associated oxidative stress. *Inflam matson and apoptosis in rodent model." Mediators of inflammation,* 2014; 1: 1.
16. G.W Burton. "□-caroitene: An unusual type of lipid antioxidant." *Science*, 1984; 2: 569-573.
17. Harshad S Dalke, Abhishek B Wankhade, Manish R Bhise, and Mahesh B Narkhede, "Desine and characterization of nutraceutical lipstick of beetroot powder." *Innovate International Journal Of Medical And Pharmaceutical Sciences,* 2019; 4: 2.
18. I Gheith , and A.E Mahmoudy. " laboratory evidence for the hematopoietic potentialof beta vulgaris leaf and stalk extract in a phenylhydrazine model of anemia."

Braz.J.med.biological research, 2018; 51: 11.

19. K Kavitha, Asish Bhaumik, Md Salma Sultana, M. Kavitha, and R. Kavitha: "Phytochemical Screening and Evaluation of Analgesic Activity of Various Extracts of Beet Root (Beta Vulgaris)." *World Journal of Pharmacy and Biotechnology*, 2016; 3, 2: 60-64.
20. Krutti Bhatt and Peenal Sankhla. "A study on consumer buying behavior towards cosmetic products." *International Journal of Engineering Technology Science and Research*, 2017; 4, 12: 1244-1249.
21. Kulkarni SK, book of experimental harmacology. I sted. Vallabh Prakashan; New Delhi (india), 1987; 1.
22. Laxmi S. Joshi and Harshal A Pawar: "Herbal cosmetics and cosmeceuticals: An overview." *Natural products chemistry and research*, 2015; 3, 2: 2-8.
23. Life N lesson.com [online] available: https://zotezo.com/in/top/beet-lip-plumper-inindia.
24. Liliana Ceclu And Oana-Viorela Nistor "Red Beet: composition and health effects a review" *Journal of nutritional medicine and diet care*", 2020; 6, 1: 2572-3278.
25. Madhav Satheesh N.V and Abhay Pratap Yadav: An impressive and idealistic platform for dry delivery." *International of pharmacy research*, 2014; 4, 4: 10601062.
26. Maithili Agarwal, Anuradha Singh, Nupur Mathur, and Sakshi Sharma: "Comparative Study of Synthetic and Herbal Cosmetic Products for Their Toxicity Assessment By Microbial Bioassays." *International Journal of Scientific & Technology Research*, 2019; *8:* 8.
27. Maria Vernica Fernandez, Rosa Juana Jagus, and Maria Victoria Aguero. "Evaluation and characterization of nutritional, microbiological and sensory properties ofbeet greens." *Aeta scientific nutritional health*, 2017; *1*, 3: 37-45.
28. Mayuri Kadu, Dr. Suruchi Vishwasrao, and Dr. Sonia Singh. "Review on natural lip balm" *International journal of research in cosmetic science*, 2015; 5, 1: 1-7.
29. M.C Mahanthese, A.S Manjappa, M.V. Shinde, A.S. Sherikar, I.J. Disouza, B.U Namrata, R.K. Karanti, C.W. Ajija. "Design development and assessment of herbal lipstick from natural pigments." *International Journal Phamaceutical Sciences Review and Research*, 2020; 61, 1: 59-64.
30. Medicinal Plant Pharmacognosy: [Online] Available: https://www.Medicinalplants-pharmacognosy.com/herbs-medicinalplants/beet/benefits- for-health/
31. Miraj Sepide: Chemistry and pharmacological effect of Beta Vulgaris: A systematicreview. Der pharmacia letter, 2016; 8, 19: 404-409.

32. Simanchal Panda, Niranjan Dalepati, Prasanna Kumar Kar. "Preparation and evaluation of H.L." *World journal of pharmaceutical research,* 2018; 7, 9: 245-249.
33. Munmun Dhakal, Prabal Sharma, Shuvo Ghosh, Biswaraj Paul, and Sonam Bhutia, Prosanta Pal. "preparation and evaluation of herbal lipsticks using natural pigment lycopene *(Solanum lycopersicum*). *UJPSR,* 2016; 2, 2: 23-29.
34. Nand S, Cosmetic technology. Birla publication pvt. Ltd, 2007; 1: P-30-52.
35. Navnidhi Chhikara, Komal Kushwaha, Paras Sharm, Yogesh Gat and Anil panghal. "Bioactive compounds of beetroot and utilization in food processing industry: a critical review." *Food chemistry,* 2019; 272: 192-200.
36. Neha Dewedi, Archana Singh, Dr. Mamta Jaiswal and Kiran Agrahari" Standardization and development of beetroot based product" *International Journal of homescience, 2017; 3, 2: 26-30.*
37. Netzel M. "Renal excretion of antioxidantive constituents from red beet in humans." *Food research int,* 2005; 38: 1051-1058.
38. Nileshwari P Chaudhari, Namrata V. Chaudhari, Harshada A. Chaudhari, Laxmi A. Premchandani, Amit Kumar R. Dhankani, and Dr. Sunil P. Pawar. *Indian journal of drugs*, 2018; 6, 3: 174-179.
39. Niranjan Dalepati, Prasanna Kumar Kar and Simanchal Panda. "Preparation and evaluation of H.L." *World journal of pharmaceutical research,* 2018; 7, 9: 245249.
40. Nuha Rasheed, Syed Abdul Rahman, Samreen Hafsa. "Formulation and Evaluation of Herbal Lipsticks". *Research J. Pharm. and Tech,* 2020; 13, 4: 1693-1700.
41. Nuramirah Juma at, Nur Aisyah Rahmat, Siti Aisyah Hamidi and Norhidayu Adnan. "The production and stability evaluation of natural lipstick." *Multidisipillinary applied research and innovation,* 2021; 2, 2: 220-225.
42. Parvin Mirmiran, Zeinab Houshialsadat and Fereidoun Azizi. "Beetroot (*Beta Vulgaris*) in management of cardio-metabolic diseases." *Nutri. Metab,* 2020; 17: 3.
43. Pallavi S. Karanje, Rajendra C.Doijad and Rohit R. Bhosale" Formulation and Evaluation of herbal lipsticks containing amaranthus cruentus linn" *internation journal of research and analytical reviews, 2020; 7, 1: 246-251.*
44. Pallavi V Bhokare, P. A Nand Khadke, Harshada A Gaikward and Shushma P Mote. "Comparative Phytochemical Screening Of Different Extraction Technique And Formulation, Characterization Of Herbal Lipsticks Containing *Beta Vulgaris Linn." World journal of pharmaceutical research,* 2017; 6, 6: 75-761
45. P. Neha, S.K Jain, N.K Jain, H.K Jain and H.K Mittal: "Chemical and functional

properties of beetroot (*Beta Vulgaris Linn*) for product development: a review." *International journal of chemical studies,* 2018; 6, 3: 3190-3194.

46. P. Ninfali and D. Anglino. "Nutritional and functional potential of beta vulgaris cicla and rubra." *Fitoterapin,* 2013; 84: 188-199.
47. P. Nyirady, E. Sardi, G. Beko, M. Szucs, A. Horvath, E Szekely. "anti-cancer "*Orvasi Hetilap,* 2010; 13, 37: 1495-503.
48. Pooja Dalavi, Rutuja S. Nanaware, Rutuja R. Shah and S. Adnaik. "Formualtion and evalution of herbal lipsticks*." International journal of pharmacy and pharmacy pharmaceutical research, 2001; 21-25.*
49. Polyana Batoqui Franca Biondo, Joana Schuelter Boeing, Erica Oliveria Barizao, Nilson Evelazio Desouza, Makoto Matsushita, Claudio Celestino de Olivera, Marcela Boroski, Jesui Vergilio Visentainer. "Evaluation of beetroot (*Beta vulgaris* L.) leaves during its developmental stages: a chemical composition study." *Food Science Technology,* 2014; 34, 1: 94-101.
50. Prashant nayak, Narayana charyulu r, Sandeep ds, sonal d'souza, nishmitha gretta d'souza. "Development and characterization of herbal lip jelly containing *beta vulgaris* alcoholic extract for lip shade." *Research journal pharm and technology*, 2016; 9: 14511454.
51. Rajesh Kumar Nema and Kamal Singh Rathore, BAL Krishna Dubey. "text of cosmetics." I st Ed. New Delhi (India): CBS publisher & distributors, 2009; 69-81.
52. Rajnigandha N. Chavan, Komal V. Dalvi, Mrs. Mansha S. Karp, Dr. Vilasrao J. Kadam. "Formulation and evaluation of lipstick using natural colorants." *Indo American Journal of Pharmaceutical Research,* 2017; 7, 3: 3-6.
53. Rety Satyawaty, R.M Pratama. "The usage of jati leaves extract (tectona grandis L.) as color of lipstick." *Traditional medicine journal,* 2018; 23, 1: 16-22.
54. R.G Kale. "Studies on evaluation of physical and chemical composition of beet root (beta vulgaris L.)." *International Journal of chemical studies*, 2018; 6, 2: 2977- 2979.
55. Richa Kothari, Bhavya Shukla, Divya Guatam , Minisha Bagaria and Akansha Sharma. "Formulation and evaluation of herbal lipstick from natural edible colorinmatter." *International journal of theoretical and applied sciences*, 2018; 1: 17-20.
56. Sakshi bajpai, 2021; 28.
57. [online] available: https:/www.stylecraze.com/articles/beet-herbal-lip-balms
58. Saraya Samaddar: (2021).[online] available: https://lifenlesson.com/best-organic lip plumper in

india.

59. Shivani Chauhan, Kartik Chamoli and Shilpa Sharma. "Beetroot- A Review Paper." *Journal of Pharmacognosy and Phytochemistry*, 2020; 9, 2: 424-427.
60. Shivanand Pandey and Nilam Meshya D.viral." "Herbal play an important role in thefield of cosmetic." *International journal of pharm tech research*, 2010; 2, 1: 632-639.
61. Simanchal Panda, Niranjan Dalapati and Prasanna kumar Kar "Preparation and evaluation of Herbal.Lipstick." *World Journal ofPpharmaceutical Research,* 2018; 7, 9: 245-249.
62. S.K Gediya: "Herbal plant; use as cosmetics." Journal nutrition product plantresources I eds, 2011; 24-32.
63. Swetha Kruthika V, S Sai Ram, Shaik Azhar Ahmad, Shaik Sadiq, Sraddha Deb Mallick and T Ramya Sree. "Formulation and evaluation of natural lipstick from colored pigments of *Beta Vulgaris* taproot." *Research and Reviews in Pharmacy and Pharmaaceutical Sciences*, 2022; 11: 1.
64. Sunayana Singu, Revan Siddappa, Malgi, Uttam Prasad Panigrahy, Abbulu Konde. "Formulation and evaluation of herbal lipstick from flower extract and analytical bioactive characterization and quantification." *International journal of innovative science and research technology*, 2019; 4, 1: 407-414.
65. Susmaitum, Anjar Mahardian Kusuma, Arif Budimab, Indri Hapsari. "The physical properties and stability of purple yam (*Ipomoea batatas L.*)lipstick." *Pharmaciana*, 2018; 8, 2: 283-290.
66. Tan Yong Ling. "preparation of lipstick with red draon fruit."engineering.thesis university of tunku abdul rheman, 2020.
67. Tom Clifford, Glyn Howatson, Daniel J. West, and Emma J. Stevenson. "The potential benefits of red beetroot supplementation in health and disease." *Nutrients*, 2015; 7: 2801-2822.
68. Verma Shashi, Tripathi Devika, Tiwari Ritesh Kumar. "Formulation and evaluation of natural lipsticks prepared from *Bixa Orellana* seeds and Daucus carota root extractand their comparative study." *Journal of pharmaceutical science and bioscientific research*, 2017; 7, 1: 131-135.
69. V.Anilkumar, M.D Dhanaraju. "A Review on Herbal Lipsticks." J *Pharm Adv Res Journal on an International Multidisciplinary* Peer Review, 2021; 4, 4: 1179- 1190.
70. Vasil georgiev, Jest Weber, Eva-Maria Kneschke, Petko Nedyalkov Denev, ThomasBley, Atanas Ivanov Pavlov. "Antooxidant activity and phenolic content of betalain extracts from intact plants and hairy root cultures of the red beet root Beta vulgaris CV. Detroit

dark red." *Plant foods human nutrition*, 2010; 65: 105-111.

71. Vaishali S. Jagtap, Pallavi M. More and Dr. Urmilesh Jha. "Formulation and characterization of herbal lipstick using colored pigment of punica granatum." *World journal of pharmaceutical research*, 2020; 4, 4: 1717-1721.
72. Zeynep Filiz: "Determination of synthetic colorants in cosmetic products by reversed-phase high-performance liquid chromatography coupled with diode-array detector." Journal of research in pharmacy, 23: 6.