



“THERAPEUTIC POTENTIAL OF CELOSIA ARGENTEA AND CURCUMA LONGA IN WOUND CARE: A FORMULATION STUDY”

Jondhale Nikita¹, Jondhale Tejal¹, Sunayana Vikhe^{2*}.

¹ Student, Department of Pharmacognosy, Pravara Rural College of Pharmacy, Loni, Maharashtra, India-413736;

^{2*} Asst Prof. Department of Pharmacognosy, Pravara Rural College of Pharmacy, Loni, Maharashtra, India-413736;

*Correspondence:

Dr. Sunayana R. Vikhe

Asst Prof. Department of Pharmacognosy, Pravara Rural College of Pharmacy, Loni, M

Abstract:

The current study aimed to develop and assess a herbal topical formulation as an alternative to synthetic treatments. Herbal remedies are used to improve look, moisturize, nourish, and treat skin disorders. Herbal cosmetics are concoctions intended to improve human appearance. The cream was prepared with *Celosia argentea* & *curcuma longa* extract. The extract was produced by utilizing ethanol as a solvent. Formulating and assessing a herbal topical formulation as a substitute for synthetic medications was the goal of the current study. Herbal remedies are used to treat a variety of skin conditions as well as to improve a person's look by moisturizing and nourishing the skin. *Celosia argentea* is a weed that develops during the rainy season in India and other tropical regions of the world, including Africa, America, South Asia, and Sri Lanka. It has also historically been used to treat fever, wounds, gonorrhea, and jaundice. *Curcumin*, the most potent ingredient in the rhizome of *Curcuma longa* L. (commonly known as turmeric), has been researched for many years because of its many biofunctional qualities, particularly its anti-inflammatory, anti-microbial, antioxidant, and radical-scavenger effects, all of which are essential for wound healing. Additionally, *curcumin* sped up the management of wound restoration by promoting the synthesis of the growth factors necessary for wound healing. This study summarise detail study of usefulness of plant, method of extraction, method of preparation and study of evaluation parameter of wound healing cream.

Keywords: *celosia argentea*, wound healing, extraction, herbal formulation, biofunctional quality.

Introduction:

Burns represent one of the most severe forms of injury affecting human health, contributing significantly to disease and long-term disability worldwide, particularly in developing countries. The process of healing from burns is complex, and there are limited treatment options available to facilitate recovery. Additionally, burn wounds are highly vulnerable to infections and other complications, with reports indicating that 50-75% of fatalities in hospitals are attributed to infections related to burn injuries. To restore the disrupted anatomical integrity and functional capacity of the skin, effective healing of burn wounds is essential. (Bahramsoltani R 2014, Maenthaisong R 2013, Maenthaisong R 2007) Several factors are crucial in the healing process, including human acidic fibroblast growth factor, angiogenesis, and tissue repair mechanisms. The repair of damaged

tissue follows a specific sequence of events, which encompasses inflammation, proliferation, and the migration of various cell types.(Ashok Kumar CK 2013) The inflammatory stage commences immediately following the injury, beginning with vasoconstriction that promotes homeostasis and the release of inflammatory mediators. This is followed by a proliferative phase, characterized by the formation of granulation tissue primarily composed of fibroblasts and the process of angiogenesis.(Hackam DJ2002, Singer AJ1999, Werner S2003)

The *Celosia* genus is classified within the Amaranthaceae family. Its name originates from the Greek term "kelos," which translates to "burned," alluding to the flower heads that resemble flames. Over seventy distinct species have been recognized, with *C. argentea* being commonly utilized as a leafy vegetable. Consequently, we have chosen *Celosia argentea* as the focus of this study, which will provide insights into its phytochemical properties and therapeutic applications. *Celosia* species are classified as quantitative short-day plants, characterized by alternate leaves that are either entire or occasionally lobed. *C. argentea* is an upright, coarse, simple, branched, and smooth annual herb, typically ranging from 0.5 to 1.5 meters in height, although it can occasionally exceed this range. Initially, it has few branches, which increase as it approaches flowering. The leaves are alternate, generally entire or rarely lobed, and exhibit a light green hue. Their average dimensions are approximately 2 by 6 centimeters, with those on flowering shoots being slightly longer. The green foliage may also contain significant quantities of betalain pigments. The plant produces small flowers that are often pinkish or white, arranged in dense, erect spikes measuring 8 to 12 millimeters in length. These spikes are solitary, erect, stout, and can be white, purple, or pink, with a glistening appearance. They typically range from 3 to 30 centimeters in length and 1.5 to 2 centimeters in thickness, lacking petals. The sepals measure 6 millimeters in length, exceeding the bracts. The fruits are membranous, and the flowers of *C. argentea* produce a substantial number of seeds, each approximately 1 millimeter in diameter and usually black in color.(B. J. Divya ,Volume 8, Issue 3, 488-505.)

The four stages of the wound healing process include tissue remodeling, inflammation, proliferation, and homeostasis. A perfect wound-healing agent should be antibacterial to prevent infection, anti-inflammatory to reduce inflammation, and proliferative and regenerative to accelerate tissue remodeling and cell proliferation. Since ancient times, curcumin has been used to treat wounds; nevertheless, many studies have only recently shown that it is helpful in treating both acute and chronic wounds. *Curcumin* is a powerful therapeutic agent since it works as an antibacterial, antioxidant, and anti-inflammatory as well as encouraging tissue growth and remodeling.(Anand P2007)

Plant description:

1.*Celosia argentea* linn.-

Synonyms-

English Name: Silver cockscomb, white cockscomb, flamingo feathers, wheat celosia.

Hindi Name: Garkha, garke.

Marathi Name: Kurdu kurda.

Taxonomical classification:

Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Mangnoliophyta
Class	Magnoliopsida
Subclass	Caryophylliadae
Order	Caryophyllales
Family	amaranthaceae
Genus	Celosia
Species	<i>Celosia argentea linn.</i>

Distribution:

India: all over India. Other country: Nepal, Bhutan, SE Asia, China, Japan, korea, tropical Africa, at altitudes of 500-1600m.

Botanical Description-Silver cockscombs are erect, branching plants, 60-75 cm tall, with narrow- elliptic or lance- shaped, strongly veined leaves 5-15 cm long, and hundreds of tiny flowers packed in dense spikes of silver- white flowers which usually stand above the foliage. They are beautiful plants with soft, dense feathery spikes, produced in profusion. Wonderful straw –like flower when dried. It offers fresh shape and color to cut flower, or everlasting flower arrangements, with 10-13 cm flower spikes on 60 cm stems. Slender cylindrical pink or rose flowerheads have a metallic sheen because the individual flowers are silvery – white at their bases. Silver cockscomb is found in india.(<http://www.flowersofindia.net/catalog/slides/Silver%20Cockscomb.html>.)

Research Through Innovation



Fig.1:celosia argentea linn.

2. *Curcuma longa*-

Synonyms:

Hindi: Haldi

Arabic and Hebrew: Kurkum

Mandarin Chinese: Huang jiang

French, German, Italian, and Spanish: Curcuma

Portuguese: Açafraão-da-terra or acafrão-da-India

German: Kurkuma gelbwurzel

Chinese: Yu chin

Sanskrit: Haridra, Rajani, Nisha Haldi, Halada

Taxonomical classification:

kingdom	Plantae
subkingdom	Tracheobionta
superdivision	Spermatophyta
Division	Magnoliophyta
class	Liliopsida
Subclass	Zingiberidae
Order	Zingiberales

family	Zingiberaceae
Genus	Curcuma
Species	Longa

Distribution:

Turmeric (*Curcuma longa*) is a plant that is native to India and is now widely cultivated in tropical and subtropical regions of the world.¹⁵

Botanical description- Turmeric, scientifically known as *Curcuma longa*, is a perennial, herbaceous plant belonging to the ginger family (Zingiberaceae), characterized by its large, oblong, dark green leaves and a thick, segmented underground rhizome that produces a bright orange powder when dried and ground, known for its vibrant yellow color and distinct aroma; the plant typically grows up to 1 meter tall, with flowers appearing on a spike-like stalk as pale yellow to white blooms, and is primarily cultivated for its rhizome which is used as a spice and in traditional medicine. (<https://en.wikipedia.org/wiki/Turmeric#:~:text=Turmeric%20powder%20is%20about%2060,turmeric%20is%20due%20to%20curcumin.>)



Fig.2: *curcuma longa*.

Methodology:

1.Collection & identification of plant-

The plant *Celosia argentea* was collected in 23 september 2024 from nimgoan jali. After collection, the plant was given to the PVP senior college , loni for the identification.

Ref.no./PVPC/Bot./2024-25/309

2.Extraction process –

2.1 Plant material preparation and drying-

First, the leaves are separated from the stem, and then to remove dust particles, The leaves were washed with clean water. After washing, the leaves were placed for sun drying, Almost three weeks. After proper drying, the leaves were blended into powder form using a grinder. Finally, the powder was stored in an airtight container and kept in a dry and moisture-free place.

2.2 Extraction of plant material-

A. Hot extraction: 500 g of coarsely ground, shade-dried *Celosia argentea* was put in a Soxhlet extractor with ethanol, and ethanol was then used to extract the material incrementally. Alcohol was effectively recovered from the extract using a straightforward distillation process that was kept in a silica chamber. (Idson, B, 1987)

B. Cold extraction involved taking 500g of *Celosia argentea*, adding it to a flat-bottom flask with 250ml of alcohol, and keeping it in an incubator chamber at 35°C for 10 days while shaking it occasionally. At room temperature, the surplus alcohol in the mixture was filtered and evaporated. (Idson, B, 1987)

Formula-

Table.1: Formula of cream.

Sr.no.	Ingredient	Quantity	Category
1.	Celosia argentea extract	2%	Anti infective
2.	Turmeric powder	1%	Antibacterial
3.	Stearic acid	1gm	Emulsifier
4.	Carnoba wax	0.20gm	Thickening agent
5.	Lanoline	0.3gm	Moisturizer
6.	Methyl paraben	0.05gm	preservative
7.	Glycerol	4ml	Humectant
8.	Triethanolamine	0.2ml	Neutralizing agent
9.	Water	q.s.	Solvent

Preparation –

Stearic acid and other substances that dissolve in oil In the oil phase (Part A), cetyl alcohol and lanoline were dissolved by heating to 75° C. The water-soluble ingredients, including the preservatives Once dissolved in the aqueous phase (Part B), methyl paraben, triethanolamine, and glycerol ethanol were heated to 75° C. Sections of the heated oil phase were introduced to the aqueous phase while being constantly stirred to generate a homogenous cream. (Idson, B, 1987 , Rajendra Gyawali 2016)

Evaluation:

1.spreadability test-(Qingbin W, 2011)

0.1g Sample was applied between two glass slides and was compressed to uniform thickness by placing 100gm weight for 5 minutes. Weight was added to the pan. The Spreadability was calculated by using radius of circle formed by compressed slide $\text{Spreadability} = m \cdot l / t$

m = Weight tide to upper slide

l = length moved on the glass slide

t = time taken.

2.Homogeneity-

The formulations were tested for the homogeneity by visual appearance and by touch.

3. Appearance-

The appearance of the Cream was judged by its color, pearlescence and appearance graded.

4.Removal-

In this test, we taken small amount of cream apply on skin of hand. After some time wash the hand with tap water and observe the removability of cream.

5.pH of formulation- (Verma H,2012 , Markandeya AG,2013)

The pH meter was calibrated using standard buffer solution. About 1 gm of the cream was weighed and dissolved in 50ml of distilled water and its pH was measured.

6.Antimicrobial activity-

The extract was inoculated on the plates of nutrient agar medium well diffusion method and a control was prepared by omitting the extract. The antibacterial activity was check with clinical stains of *E.coli*, *Staphylococcus aureus*. The plates were placed in to the incubator and are incubated at 37°C for 24 hours. After the incubation period, plates were taken out and check the microbial growth by comparing it with the control. (Mhatre, J.,2014, Rama Hiolaa,2018)

8.In vitro Cytotoxicity Test of Celosia argentea by MTT Assay on HeLa Cell Line-

Cytotoxic effect was examined in this test. In brief, Hela, a human cervical carcinoma cell line was maintained in DMEM (dulbeccos modified eagles medium) containing 1% penicillin streptomycin (1:1) and 0.2% gentamycin and 10% fetal bovine serum (FBS). Hela cells were seeded onto 96 well plate and incubated at 37 degree Celsius+ 5% CO₂. Next day, 25 microliter of sample (filtered) was added each well. Cytotoxicity was examined after 48h of incubation using cell counting kit-8 (CCK), a non-radioactive colorimetric cell proliferation and cytotoxic assay kit. Duplicate wells were used for each sample. The cytotoxic effect of ethanolic extract of *Celosia argentea* was done by MTT assay on HeLa cell line. Specific sample ethanol extract concentrations (50 µg/ml,100 µg/ml,200 µg/ml,800 µg/ml and 1200 µg/ml) were used to examine the cytotoxic activity. 2 % DMSO had been used as a negative control in the DMEM medium. Absorbance for each one of the concentrations was recorded at 450nm including their average was measured. The Survival rate of cells and % of HeLa cell line growth inhibition in different concentration.(Mosmann T1983, Bhulabhai PJ. 2016)

Result & discussion:

1.spreadability test-

The spreadability test was passed and formulation is easily spread on skin.

2. Homogeneity test-

All formulation produced uniform distribution of extract in cream this was confirmed by visual appearance and by touch.

3.Appearance-

The appearance of cream is smooth. The color of cream is greenish. The odor of cream is pungent& characteristic.

The given formulation is O/W emulsion.

4. Removal-

The cream was easily removable by washing with tap water.

5. pH-

The pH of the cream was found to be in range of 5.6 to 6.8 which is good for skin pH.

6. Antimicrobial activity-

The antimicrobial activity of plant extracts were tested against two bacterial strain. The bacterial species namely *Bacillus subtilis*, *Staphylococcus aureus* expressed differential sensitivity to the plant extracts as indicated by their zone of inhibitions. It signifies that the ethanol extract of plant show zone of inhibition.

Table.2: Result of antimicrobial activity.

Sr.no.	Organisms	Inhibition by formulation (mm)	Inhibition by DMSO(mm)	Inhibition by marketed formulation(mm)
1.	<i>Bacillus subtilis</i>	15	0	18
2.	<i>Staphylococcus aureus</i>	11	0	17

8. In vitro Cytotoxicity Test by MTT Assay on HeLa Cell Line-

Table.3: Result of MTT assay.

Sample concentration ($\mu\text{g/ml}$)	Absorbance 450nm	Survival of cell(HeLa)%	%cell growth inhibition
2%DMSO	3.735	100	0
50	3.676	94.64	5.36
100	3.468	91.27	8.73
200	3.585	90.64	9.36
800	2.678	66.98	33.02
1200	1.239	49.27	50.73

The survival percentage of the HeLa cell was perceived through the trinocular microscope, it is perceptible that highest cell toxicity was noticed on HeLa cell line at 1200 $\mu\text{g/ml}$ and moderate cytotoxicity at 50 $\mu\text{g/ml}$ concentration of sample extract. When the concentration of sample extract was higher (1200 $\mu\text{g/ml}$), highest cell death was detected (50.73% cell death where survival of HeLa cells were 49.27% after 48 hours of incubation). So, it can be concluded that 1200 $\mu\text{g/ml}$ of sample concentration provided the satisfactory cytotoxic potential as highest percentage of cell death 50.73% was observed compared to other concentrations. At the other three concentrations (800 $\mu\text{g/ml}$, 200 $\mu\text{g/ml}$, 100 $\mu\text{g/ml}$, 50 $\mu\text{g/ml}$), extracts exhibited weak cytotoxic activity as the percentage of inhibition was 33.02%, 9.36%, 8.73% and 5.36% respectively.

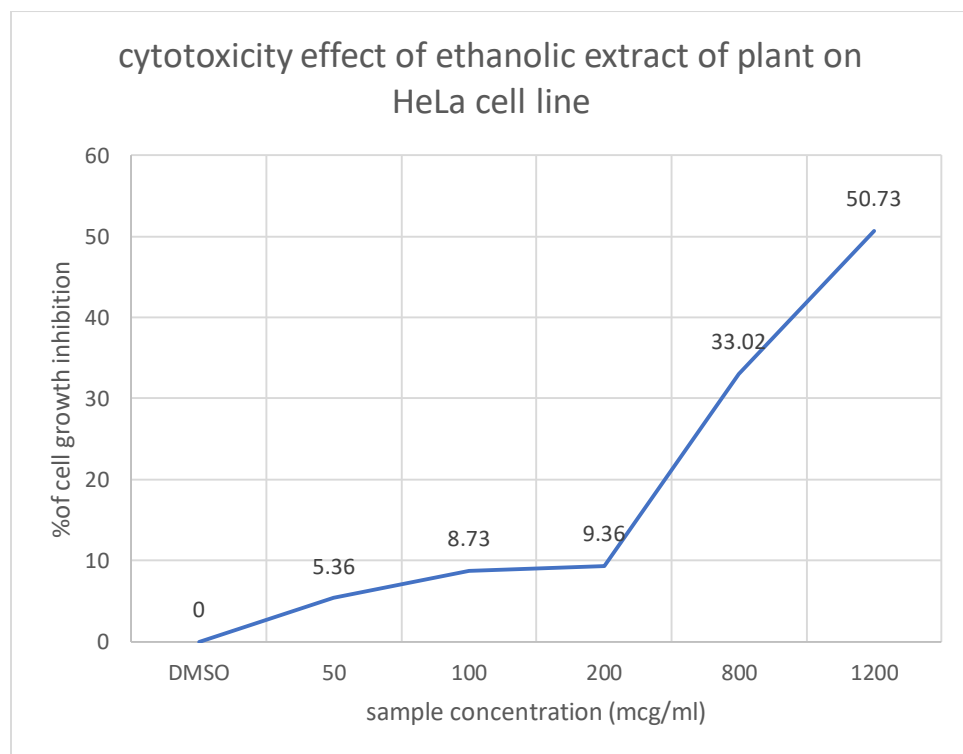


Fig.3: In vitro Cytotoxicity Test of plant by MTT Assay on HeLa Cell Line (% of cell growth inhibition vs sample concentration ($\mu\text{g/ml}$))

Conclusion:

During the study period, the produced formulation demonstrated high consistency, no signs of phase separation, and good spreadability. Based on the aforementioned research, it is feasible to create a cream using botanical extracts. Significant wound-healing activity was demonstrated by *Celosia argentea*'s & *curcuma longa*'s ethanolic extract. According to the findings of various cream experiments, the formulation could be applied topically to shield skin from harm.

Acknowledgement:

The authors would like to sincerely thank the Principal, Pravara rural college of Pharmacy, pravaranagar, Dr. Sunayana vikhe for providing all the excipients and proper facilities that are required for the formulation.

References:

- [1]Hackam DJ, Ford HR. Cellular, biochemical, and clinical aspects of wound healing. Surg Infect (Larchmt) 2002; 3: S23-S35
- [2]Singer AJ, Clark RA. Cutaneous wound healing. N Engl J Med 1999; 341: 738-746.
- [3]Werner S, Grose R. Regulation of wound heal-ing by growth factors and cytokines. Physiol Rev 2003; 83: 835-87
- [4]Bhakuni DS, Dhar ML, Dhar MM, Dhawan BN, Mehrotra BN. Screening of Indian plants for biological activity. II. Indian J Exp Biol 1969; 7: 250-262.

[5]Hase K, Basnet P, Kadota S, Namba T. Immunostimulating activity of Celosian, an an-tihepatotoxic polysaccharide isolated from *Celosia argentea*. *Planta Med* 1997; 63: 216-219.

[6]Sharma P, Vidyasagar G, Singh S, Ghule S, Kumar B. Antidiarrhoeal activity of leaf extract of *celosia argentea* in experimentally induced diarrhoea in rats. *J Adv Pharm Technol Res* 2010; 1: 41-48.

[7]Priya KS, Arumugam G, Rathinam B, Wells A, Babu M. *Celosia argentea* Linn. leaf extract im-proves wound healing in a rat burn wound model. *Wound Repair Regen* 2004; 12: 618-625.

[8]Wu Q, Wang Y, Guo M. Triterpenoid saponins from the seeds of *Celosia argentea* and their anti-inflammatory and antitumor activities. *Chem Pharm Bull (Tokyo)* 2011; 59: 666-671.

[9]B. J. Divya, M. Jyothi Sravani, J. Hari Chandana, T. Sumana and K. Thyagaraju, phytochemical and pharmacotherapeutic activities of *celosia argentea*: a review, *world journal of pharmacy and pharmaceutical research*, Volume 8, Issue 3, 488-505.

[10] Anand P, Kunnumakkara A, Newman R, Aggarwal B. Bioavailability of curcumin: problems and promises. *Mol Pharm* 2007;4:807–18.

[11]Idson, B. and Lazarus, J. 1987. “Semisolids” The Theory and Practice of Industrial Pharmacy. In: L Lachman, HA Lieberman and JL Kanigs (eds) 2 nd edition, Philadelphia, PA, pp.215–244.

[12] [http://www.flowersofindia.net/catalog/slides/Silver %20Cockscomb.html](http://www.flowersofindia.net/catalog/slides/Silver%20Cockscomb.html).

[13]Mhatre, J., Nagaral, S. And Kulkarni S., Formulation And Evaluation Of Antibacterial Activity Of A Herbal Ointment Prepared From Crude Extracts Of *Aegle Marmelos*. *International Journal Of Pharmacy And Pharmaceutical Sciences*. 2014; 6(2);575-579.

[14]Rama Hiolaa, Nurul Rizkyb, Hamsidar Hasanb, Nurain Thomasb, Formulation And Evaluation Of Langsung (Lansium Domesticum Corr.) Peel Ethanol Extracts Lotion As Anti-Mosquito Repellent, *Journal Of Reports In Pharmaceutical Sciences*: 2018, 7(3): 250-25.

[15]<https://en.m.wikipedia.org/wiki/Turmeric#:~:text=11%20External%20links,Origin%20and%20distribution,taxa%2C%20with%20overlapping%20local%20names>.

[16] Mosmann T. Rapid Colorimetric Assay for Cellular Growth and Survival: Application to Proliferation and Cytotoxicity Assays. *J Immunol Methods*. 1983;65(1-2):55-63.

[17]Bhulabhai PJ. Anticancer and cytotoxic potential of aqueous extract of *Triticum aestivum* on HeLa cell lines. *J Drug Deli Ther*. 2016;6(3):84-9.

[18].<https://en.wikipedia.org/wiki/Turmeric#:~:text=Turmeric%20powder%20is%20about%2060,turmeric%20is%20due%20to%20curcumin>.

[19] Ashok Kumar CK, Divya Sree MS, Joshna A, Mohana Lakshmi S, Satheesh Kumar DA. Review on South Indian edible leafy vegetables. *Journal of Global Trends in Pharmaceutical Sciences*, 2013; 4(4): 1248-1256.

[20] Qingbin W, Yan W, Meili G. Triterpenoid, saponins from the Seeds of *Celosia argentea* and their anti-inflammatory and antitumor Activities. *Chem. Pharm. Bull*, 2011; 59(5) 666—671.

[21] Verma H, Demla M. Standardization of whole plant of *Celosia argentea* Linn. *International Journal of Pharmaceutical Sciences and Research*, 2012; 3(8): 2695-2699.

[22.] Markandeya AG, Firke NP, Pingale SS, Gawale SS. Quantitative elemental analysis of *Celosia argentea* leaves by ICP-OES techniques using different digestion methods. *International Journal of chemical and analytical sciences*, 2013; 4: 175-181.

[23]Bahramsoltani R, Farzaei MH, Rahimi R. Medicinal plants and their natural components as future drugs for the treatment of burn wounds: an integrative review. *Arch Dermatol Res* 2014; 306: 601-617.

[24]Maenthaisong R, Chaiyakunapruk N, Nirun-traporn S, Kongkaew C. The efficacy of aloe vera used for burn wound healing: a systematic review. *Burns* 2007; 33: 713-718.

[25] Rajendra Gyawali, Nira Paudel, Sahana Shrestha, Ashok Silwal, Formulation And Evaluation Of Antibacterial And Antioxidant Polyherbal Lotion. Journal Of Institute Of Science And Technology.2016: 21 (1), 148-156.

