



## Development and Evaluation of Poly-Herbal Cream for Acne Treatment

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### ABSTRACT

Acne was found as the most common skin problem, that has an effect on regions with large oil glands, like on face, trunk and back. Medicinal plants are used all over the world to treat various diseases due to variety of phytochemical constituents. Ideally, topical therapy is primary treatment for many skin diseases. In this study, our work is to prepare cream with anti-acne and anti-scar property using ethanolic extracts of *Achyranthus aspera* and *Allium cepa*, by percolation method and prepared ten different formulations with different concentration of materials and evaluated for physicochemical parameters like color, odour, appearance, pH, washability, spread ability, viscosity, irritancy, dye test, drug content, drug release and zone of inhibition. The physicochemical evaluation of the developed formulation has shown green colour, rosy odour, easy washability, good spread ability and almost neutral pH with no lumps were observed. The maximum % drug content was found to be for the formulations are F3-95.93%, F6- 96.13%, F8- 97.60% F9- 96.83%. The maximum amount of % drug release of the formulations shown are F3- 91.44%, F6- 92.98%, F8-89.98%, F9-86.82%. and maximum zone of inhibition was found for the formulations are F3-94.98 mm, F6 -176.62 mm, F8- 314.00 mm, F9- 254.34 mm as compared with the standard formulation (Clincitop gel) was 38.46 mm. So, our polyherbal cream can be successfully used in future for skin infection i.e. acne vulgaris after confirmation of Clinical and Toxicological studies for commercial production in the market.

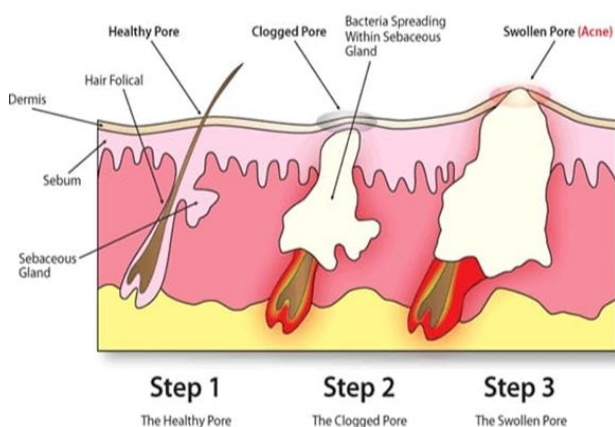
**Keywords:** Acne, Polyherbal cream, skin diseases, anti-microbial, *Achyranthus aspera*, *Allium cepa*, linseed oil.

### INTRODUCTION

The skin is the largest external organ in the body and has a surface area of about 1.5 to 2 m in adults and it contains glands, hair and nails. There are three main layers:

- Epidermis
- Dermis.
- Subcutaneous layer

Between the skin and underlying structures is a layer of subcutaneous fats.



**Figure 1:** Development of acne

Acne is a multifactorial disease affecting the pilosebaceous unit of the skin. Blockage of the pilosebaceous unit may lead to the development of acne lesions. The recent investigations suggest a possible pathogenic role for the bacterial species, *Propionibacterium acnes*,

*Staphylococcus epidermidis*, and *staphylococcus aureus* in acne vulgaris. Especially *P. acnes* which is an obligate anaerobic microorganism is responsible for the development of inflammatory acne due to its ability to activate complements and metabolize sebaceous triglycerides into fatty acids, which then chemotactically attract neutrophils. The acne is of three types, comedonal acne, inflammatory acne, nodulocysts acne. The major cause of acne is sebum, bacteria, dead skin cells.

The acne is treated with Over-the-counter topical medications, Salicylic acid and benzoyl peroxide are two common active ingredients in over-the-counter acne creams, they are effective for many people.

Topical retinoids, which are related to vitamin A, treat acne by keeping pores clear and preventing oily buildup. Retinoids can be very effective in treating acne but need to be applied properly to avoid possible side effects, including sensitivity to sunlight and dry or peeling skin.

Bacteria that cause an infection beneath your skin can lead to these blemishes. Antibiotics kill these bacteria, reducing inflammation and redness and allowing pores to clear. Typically, antibiotics start to clear skin in four weeks, and treatment can last for months.

Oral Isotretinoin for more severe forms of acne, isotretinoin, a retinoid that is taken by mouth. Retinoids clear clogged pores by reducing the amount of oil that skin glands produce and killing the bacteria that reside there. It may take several months of using oral isotretinoin to see improvements in your skin, and dermatologists recommend waiting for at least two months before assessing the results<sup>1</sup>.

## MATERIALS AND METHODS

### Collection of materials:

Materials used in this poly herbal antiacne cream are as follows:

*Achyranthus aspera*, *Allium cepa*.

**Chemicals:** Stearic acid, Cetyl alcohol, Beeswax Borax, Liquid paraffin, Propylene glycol, Sorbitol, Glycerin, Triethanolamine, Propyl paraben, Rose oil, Linseed oil, Distilled water.

### EXTRACTION OF HERBALS:

#### Flow chart of percolation:

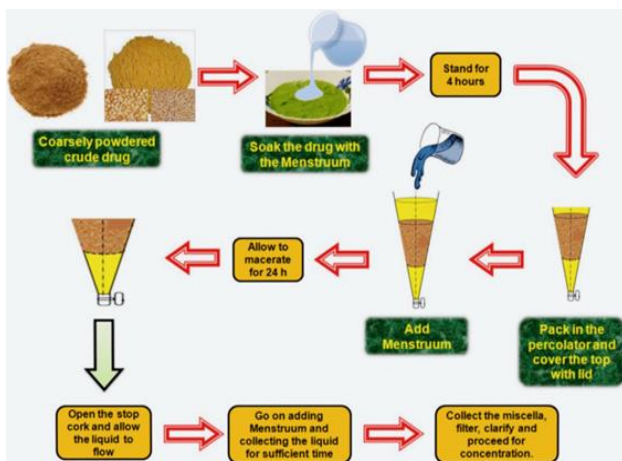
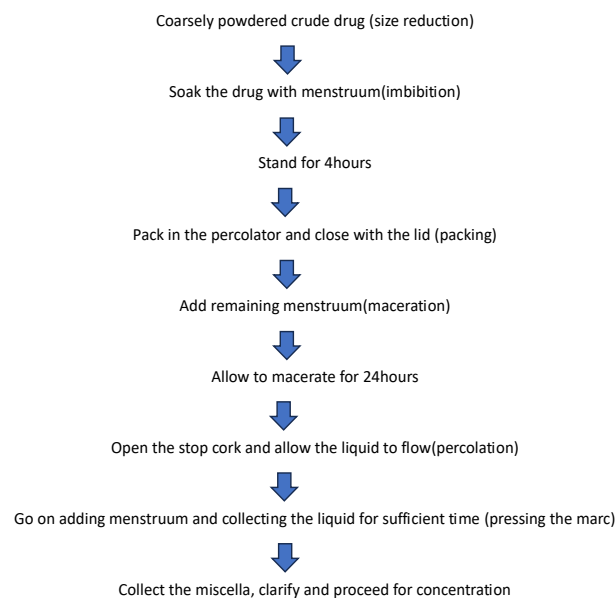


Figure 2: Percolation

### Preparation of anti-acne cream:

Liquid extract was used in preparation of W/O cream. It provides cooling effect by slow evaporation of water. The oily ingredients such as stearic acid, liquid paraffin was taken into a beaker and melted, maintaining a temperature of 75°C. Remaining ingredients such as water, glycerin, Propyl paraben was taken into another beaker and heated up to 75°C. The water-soluble components were directly added to the oil phase with constant stirring to get a cream. About 0.5 g of each plant extract was put to cream and was mixed well. 30g of cream was prepared. Repeat the same process for O/W cream<sup>2</sup>.

### Evaluation of anti-acne cream:<sup>3-9</sup>

**Drug content:** The cream (1g) was weighed exactly and placed in 100 ml volumetric flask into that 70 ml of ethanol was added. It was shaken well, volume of 100 ml with ethanol was made. It was filtered. Filtrate of 1ml was diluted and the drug was quantified using UV spectrophotometry at 250nm.

**Drug release:** The diffusion study of the creams was done by a vertical Franz diffusion cell of area 1.5 cm square, using a dialysis membrane. The membrane was placed in phosphate buffer pH 7.5 for 6-8.5hrs was fixed in the dialysis cell. 1gm of cream was uniformly spread on the membrane. This experiment was carried out in as described elsewhere earlier.

**Physical evaluation:** Physical characteristics were examined and noted. Creams were evaluated for colour, appearance, pH, Viscosity, spread ability and stability.

**Measurement of pH:** The pH of creams was tested by using Digital pH meter. One gram of cream was mixed in 100 ml of distilled water and kept for 2h.

**Viscosity:** Viscosity of cream was checked with Brookfield Viscometer. It was checked at 100 rpm at 25 °C using Brookfield Viscometer.

**Spread ability:** Spread ability is the ability of the cream to readily spread on application to skin. The bioavailability also depends on its spread ability. It is expressed in terms of time in seconds taken by two slides to slip from the cream, placed between slides, under constant weight.

Spread ability is calculated as:

$$S=M \times L / T$$

S- spread ability

M -weight (gm) tied to the upper slide

L- length (cm) of the glass slide T – time (in sec.) taken to separate the slides.

**Irritability:** Mark an area of 1 sq.cm on the left hand dorsal surface. The cream was applied to the specified area and time was noted. Irritancy, erythema, edema was checked, if any, for regular intervals upto 24 hours and reported.

**Dye test:** The scarlet red dye is mixed with the cream. Place a drop of the cream on a microscopic slide then covers it with a coverslip, and examines it under a microscope. If the disperse globules appear red the ground colourless. The cream is o/w type. The reverse condition occurs in w/o type cream i.e. the disperse globules appears colourless.

**FORMULATION OF OIL-IN -WATER CREAM:**



Figure 3: O/W and W/O creams

Table 1: Formulations of o/w cream

Ingredients	Composition (%) of O/W cream					
	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	F <sub>4</sub>	F <sub>5</sub>	F <sub>6</sub>
<i>Achyranthus aspera</i>	0.5	1.0	1.5	2.0	1.5	2.0
<i>Allium cepa</i>	0.25	0.3	2.0	1.0	0.8	1.5
Linseed oil	0.0	0.0	0.5	1.0	0.5	0.0
Stearic acid	4.0	4.0	5.0	4.0	3.5	5.0
Cetyl alcohol	0.4	0.6	0.8	1.0	1.2	0.6
Liquid paraffin	1.0	1.0	1.5	1.9	1.5	1.0
Propylene glycol	0.5	0.5	1.0	1.0	0.5	0.5
Triethanolamine	0.4	0.4	0.8	1.0	0.9	0.63
Propyl paraben	0.2	0.2	0.4	0.6	0.1	0.5
Glycerine	1.0	1.5	1.5	1.5	4.5	2.27
Water	20	16	16	15	15	16
Perfume	q. s	q. s	q. s	q. s	q. s	q. s

**FORMULATION OF WATER-IN-OIL CREAM:**

Table 2: Formulation of w/o cream

Ingredients	Composition (%) of W/O Creams			
	F <sub>7</sub>	F <sub>8</sub>	F <sub>9</sub>	F <sub>10</sub>
<i>Achyranthus aspera</i>	1.5	2.0	1	1.5
<i>Allium cepa</i>	1.5	1	1	1
Linseed oil	0.0	0.0	0.5	0.5
White beeswax	4.8	3.24	6	5
Borax	0.2	0.1	0.21	0.3
Liquid paraffin	14	13.7	12	13
Propyl paraben	0.06	0.02	0.1	0.05
Water	8.0	10	9	9
Perfume	q. s	q. s	q. s	q. s

**RESULTS**

**Drug content:**

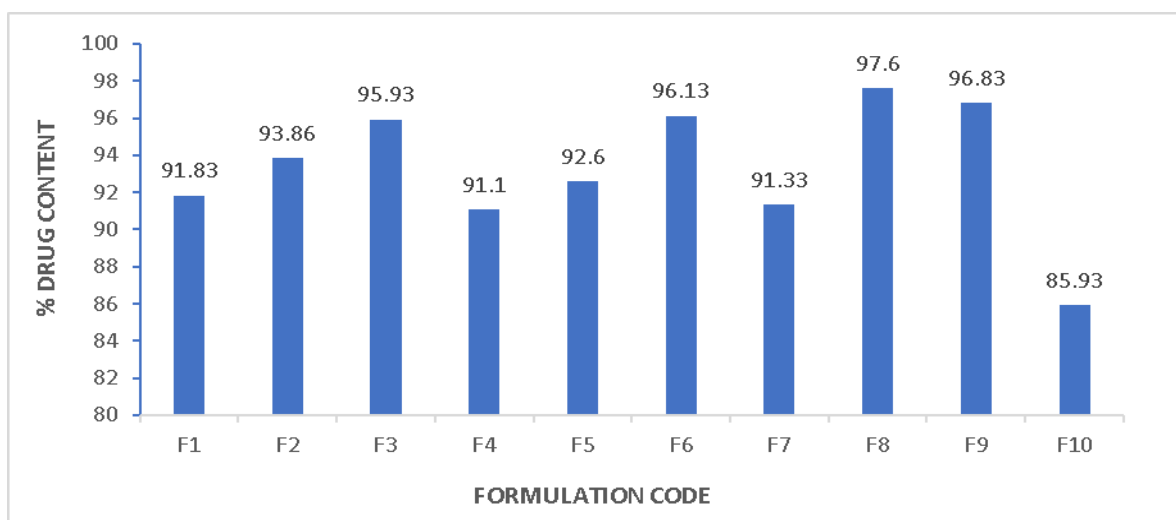


Figure 4: Graph showing the % of drug content

The maximum % drug content was found to be for the formulations are F<sub>3</sub>-95.93%, F<sub>6</sub>- 96.13%, F<sub>8</sub>- 97.60%, F<sub>9</sub>-96.83%.

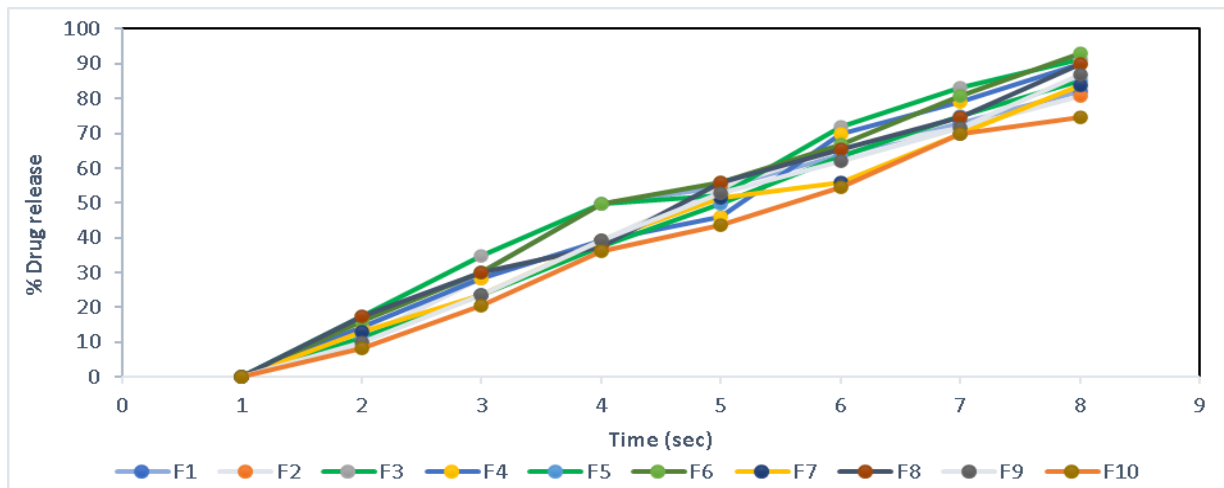
**Table 3:** Physicochemical evaluation of all the creams

Tests	FORMULATIONS O/W						W/O			
	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	F <sub>4</sub>	F <sub>5</sub>	F <sub>6</sub>	F <sub>7</sub>	F <sub>8</sub>	F <sub>9</sub>	F <sub>10</sub>
Colour	Pale green	Green	Pale green	Olive green	Olive green	Pale green	Green	Olive green	Olive green	Pale green
Odour	Rosy odour	Rosy odour	Rosy odour	Rosy odour	Rosy odour	Rosy odour	Rosy odour	Rosy odour	Rosy odour	Rosy odour
Appearance	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth
p <sup>H</sup>	6.78	6.28	6.86	7.88	6.77	6.49	8.93	8.87	8.86	8.46
Viscosity (cps)	4002	8028.8	5713	5658.4	3326.5	10359	4251.6	3464.3	5937.8	4434.1
Spread ability	37.5	38	28.8	29.4	26.28	34	14.621	20.35	16.2	28.26
Wash ability	washable	washable	Washable	washable	Washable	Washable	Washable	Washable	Washable	washable
Dye test	o/w	o/w	o/w	o/w	o/w	o/w	w/o	w/o	w/o	w/o
Irritancy	Non irritant	Non irritant	Non irritant	Non irritant	Non irritant	Non irritant	Non irritant	Non irritant	Non irritant	Non irritant

**Drug release:**

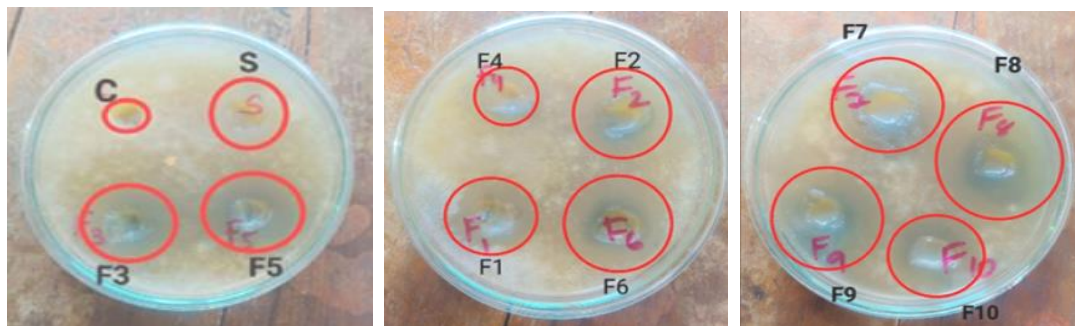
**Table 4:** % Drug release

Time (mins)	Formulations									
	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	F <sub>4</sub>	F <sub>5</sub>	F <sub>6</sub>	F <sub>7</sub>	F <sub>8</sub>	F <sub>9</sub>	F <sub>10</sub>
0mins	0	0	0	0	0	0	0	0	0	0
30mins	120.4	120.4	124.4	162.4	158.4	172.4	162.4	166.4	164.4	118.4
60mins	146.4	142.4	140.4	168.4	176.4	176.4	172.4	176.4	172.4	126.4
90mins	176.4	166.4	162.4	186.4	186.4	180.4	178.4	162.4	186.4	142.4
120mins	182.4	180.4	186.4	194.4	208.4	194.4	206.4	194.4	196.4	160.4
150mins	200.4	214.4	216.4	198.4	302.4	200.4	222.4	216.4	208.4	176.4
180mins	280.4	240.4	258.4	230.4	380.4	246.4	242.4	247.4	240.4	180.4
210mins	322.4	266.4	288.4	284.4	416.4	364.4	262.4	262.4	278.4	208.4



**Figure 5:** Graph showing the % drug release

The maximum amount of % drug release of the formulations shown are F<sub>3</sub>- 91.44%, F<sub>6</sub>- 92.98%, F<sub>8</sub>-89.98%, F<sub>9</sub>-86.82%.



**Figure 6:** Zone of inhibition

**Anti-microbial activity:** The anti-microbial activity was done with agar cup plate method and zone of inhibition was measured. The maximum zone of inhibition was found for the formulations are F<sub>3</sub>-94.98 mm, F<sub>6</sub> -176.62 mm, F<sub>8</sub>-314.00 mm, F<sub>9</sub>- 254.34 mm as compared with the standard formulation was 38.46 mm.

## DISCUSSION

All the ten antiacne creams are formulated using herbal extracts by percolation method and they are evaluated.

**Homogeneous test:** All the formulations were teste for color, odour, appearance and found to be olive green-pale green in colour, rosy odour with smooth appearance.

**pH test:** All the formulations were tested for pH using pH meter with 6.8 pH buffer solution and found to be near to skin pH.

**Spreadability (cm/sec):** Spreadability was determined by slide and weight method and among all the formulations F<sub>1</sub>, F<sub>2</sub>, F<sub>6</sub> shows good spreadability.

**Viscosity (cps):** The viscosity of all the formulations were determined using Brookfield viscometer and formulated creams are found to be in the ranges between 3326.5-10359 cps.

**Irritancy test:** The ten formulations are non-irritant to the skin.

**Washability:** The creams are easily washable with water.

**Dye test:** The dye test was conducted using water soluble dye- amaranth and found to be water-in-oil type and oil-in-water type.

**Drug content:** The drug content was determined by using UV spectrometer with pH 6.8 buffer solution. The maximum % drug content was found for the formulations as F<sub>3</sub>-95.93%, F<sub>6</sub>- 96.13%, F<sub>8</sub>- 97.60%, F<sub>9</sub>-96.83%.

**Drug release:** The drug release of all the formulations was determined by using franz diffusion method with dialysis membrane at pH 6.8 buffer solution. The maximum amount of % drug release of the formulations shown are F<sub>3</sub>- 91.44%, F<sub>6</sub>- 92.98%, F<sub>8</sub>-89.98%, F<sub>9</sub>-86.82%.

**Anti-microbial activity:** The anti-microbial activity was done with agar cup plate against p.acnes and zone of inhibition was measured. The maximum zone of inhibition was found for the formulations are F<sub>3</sub>-94.98 mm, F<sub>6</sub> -176.62 mm, F<sub>8</sub>- 314.00 mm, F<sub>9</sub>- 254.34 mm as compared with the standard formulation was 38.46 mm.

## CONCLUSION

The motivation of our work was initiated based on the review article "Medicinal plants for the treatment of acne vulgaris". This review article gives information about medicinal properties of the plants, including *Achyranthus*

*aspera* which has anti-acne property and anti-inflammatory property, *Allium cepa* has anti-scar property. In this study, our work is to prepare cream with anti-acne and anti-scar property using ethanolic extracts of *Achyranthus aspera* and *Allium cepa*, by percolation method and prepared ten different formulations with different concentration of materials. The physicochemical evaluation of the developed formulations has shown easy washability, good spread ability and almost neutral pH with no lumps were observed. The study results concluded that among all the formulations, the polyherbal anti-acne cream prepared and conceded all the pharmaceutical evaluations. Among those formulations F<sub>3</sub>-93.48mm, F<sub>6</sub>-176.62mm, F<sub>8</sub>-314mm, F<sub>9</sub>-254.34 mm have exhibited greater zone of inhibition. F<sub>3</sub>-99.44%, F<sub>6</sub>-92.98%, F<sub>8</sub>-89.98%, F<sub>9</sub>-86.82% have high % of drug release. So, our polyherbal cream can be successfully used in future for skin infection i.e acne vulgaris after confirmation of Clinical and Toxicological studies for commercial production in the market.

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