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FORMULATION AND EVALUATION OF SILVER SULFADIAZINE LADEN TOPICAL FORMULATION FOR BURN WOUND

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Abstract:
Plan: *Formulation and evaluation and of Silver Sulfadiazine Laden Topical Formulation for treatment of Burn Wound.*
Preface: *Burn injuries are very complex. One of the golden treatments in topical burn is silver sulfadiazine (SSD).The hydrogels are non- solid dosage forms that produce a flexible, occlusive film in-situ after application on the skin or any other body surface.*
Methodology: *The hydrogel matrix was prepared with combinations of PVA & PVP, HPMC E5LV, and HPMC E15LV. The prepared hydrogel were evaluated for their various physicochemical properties. The optimized formulation F3 was selected by antimicrobial activity by agar diffusion technique.*
Outcome: *All the formulations showed better antimicrobial activity when compared with marketed SSD cream. The formulation F3 was found to be the optimized formulation.*

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INTRODUCTION:

Burn wounds is one of the most widely recognized wounds in the field medication. It can incidental, self-destructive and maniacal and caused because of assortment of reasons, for example, heat, synthetic compounds, power, daylight, and radiation. As indicated by WHO assessed 180000 passings yearly. For the most part these wounds can happen in all age and sexual orientation, greatest cases females somewhat at high danger of death from burn contrasted with guys burn harms the skin or harms the tissue, this harm is difficult and may cause incapacitating scarring, deforming and passing in serious cases. It very well may be treated by utilizing Topical antimicrobial operators, for example, Silver Sulfadiazine, Silver Nitrate, Bacitracin, Nystain and so forth are utilized in burn wound patients. In ayurvedic treatment Honey, Aloe Vera, Jatyadi tail and so forth use in wound recuperating. Characteristic or Homemade Remedies treatment utilized for burn wound healing.

Classification of burns:

There are several ways of classifying burns. The following are three commonly used typologies, based respectively on the cause, extent and severity of the burn. Classification by mechanism or cause Causally, burns may be classified as thermal or inhalational.

- Thermal burns involve the skin and may present as:

i. **Scalds**: caused by hot liquid or steam;
ii. **Contact burns**: caused by hot solids or items such as hot-pressing irons and cooking utensils, as well as lighted cigarettes;
iii. **Flame burns**: caused by flames or incandescent fires, such as those started by lighted cigarettes, candles, lamps or stoves;
iv. **Chemical burns**: caused by exposure to reactive chemical substances such as strong acids or alkalis;
v. **Electrical burns**: caused by an electrical current passing from an electrical outlet, cord or appliance through the body

- Inhalational burns are the result of breathing in superheated gases, steam, hot liquids or noxious products of incomplete combustion. They cause thermal or chemical injury to the airways and lungs [(1)] and accompany a skin burn in approximately 20% to 35% of cases. Inhalational burns are the most common cause of death among people suffering fire-related burn.[(2)]

METHODOLOGY:

Weighed accurately required quantity of polymer (Table 4.4) and transferred to a bottle containing mixture of water and ethanol, which was then tightly closed. The polymer was allowed to swell overnight. Propylene glycol and drug was added to the above polymer dispersion and mixed thoroughly in a mechanical stirrer until a uniform gel was formed. The formulation was stored in a well closed air tight black colour bottle and protected from light.[(3,4,5,6)]

Table 1: Formulation of Silver sulfadiazine hydrogels

S.No.	Ingredients (%w/w)	F1	F2	F3	F4	F5	F6
1.	Silver Sulfadiazine	1	1	1	1	1	1
2.	Polyvinyl Alcohol	12.04	15.48	17.2	-	-	-
3.	Polyvinylpyrrolidine K30	1.96	2.52	2.8	-	-	-
4.	HPMC E15LV	-	-	-	5	7	9
5.	HPMC E5LV	-	-	-	-	-	-
6.	Propylene Glycol	3	3	3	3	3	3
7.	Ethanol	8	8	8	8	8	8
8.	Water	74	70	68	83	81	79

Evaluation of Hydrogel

1 Viscosity

Table 1.1 Viscosity variation of different formulations

Formulation code	Spindle no.	RPM	Viscosity (cps)
F1	1	10	78201
F2	1	10	71698
F3	1	10	79264
F4	1	10	68679
F5	1	10	82879
F6	1	10	88285

Discussion: The observed viscosity was found to be within the range of 78201-88285cps

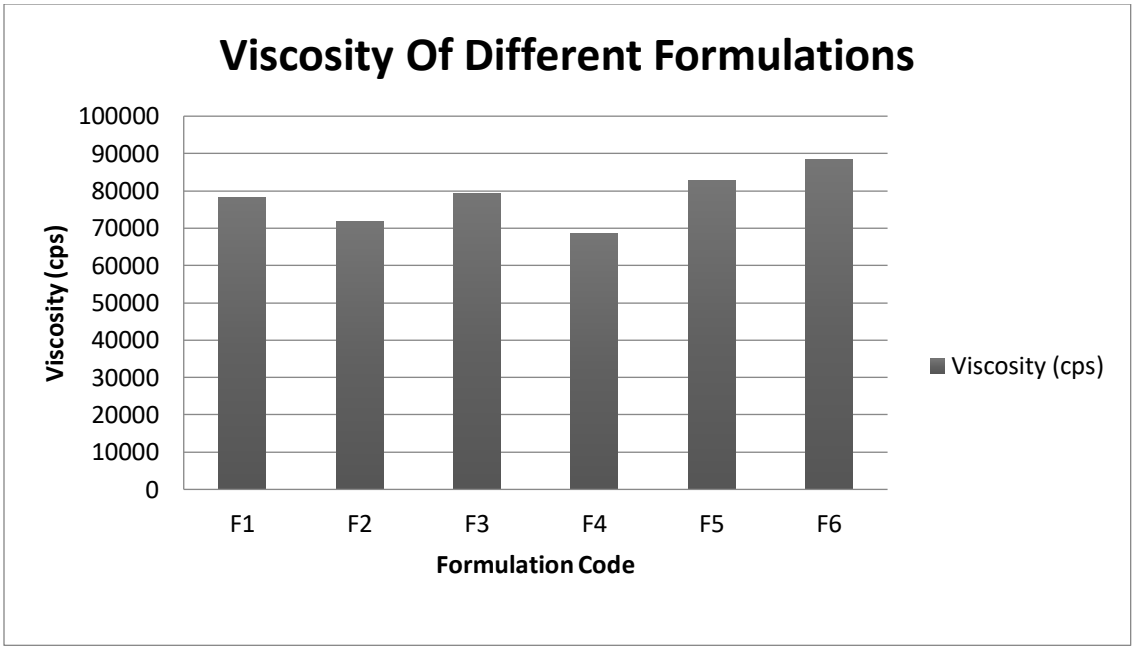

Figure 1 Viscosity of different formulation

2 Spreadability

Table 2 Spreadability variation of different formulations

Formulation code	Quantity (mg)	Diameter (cm)
F1	2	3
F2	2	3.1
F3	2	2.5
F4	2	3.5
F5	2	4.1
F6	2	2.8

Discussion: The spreadibility was found to be within the range of 2.5-4.1cm which means on application they spread uniformly.

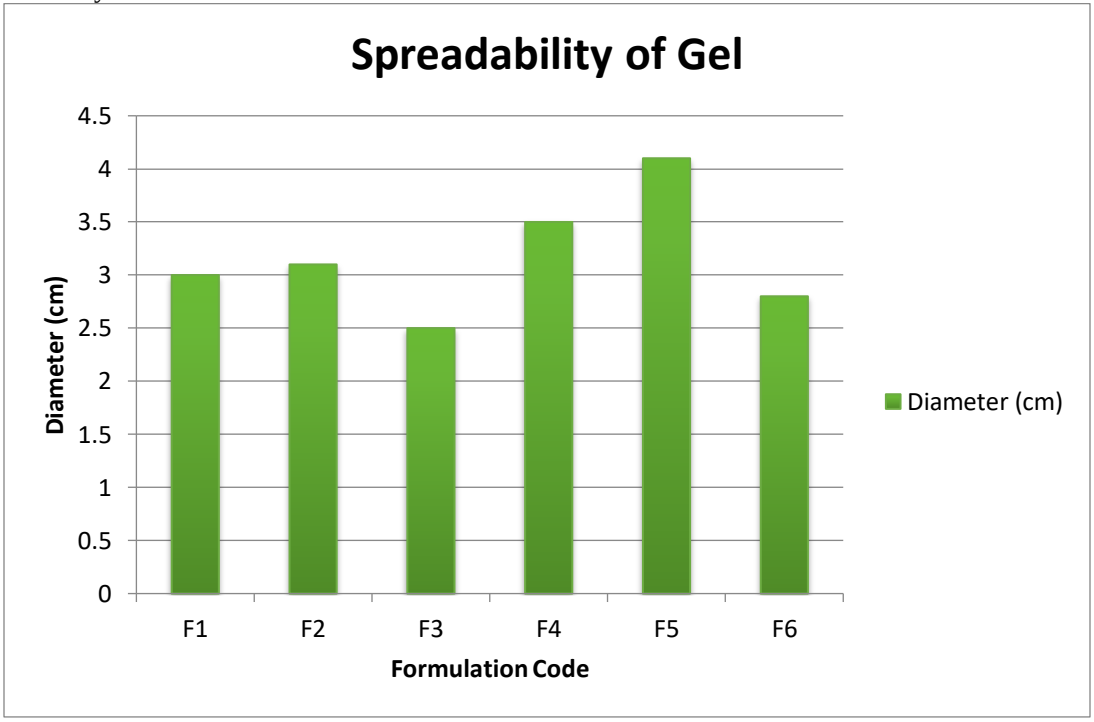

Figure 2 Spreadability of different formulation

3 pH of formulation

Table 3 Result of pH determination

Formulation code	pH
F1	3.8±0.05
F2	4.0±0.05
F3	4.3±0.05
F4	4.2±0.15
F5	4.4±0.05
F6	4.1±0.05

Discussion: The observed pH was found to be within the range indicating they were non-irritant to the skin.

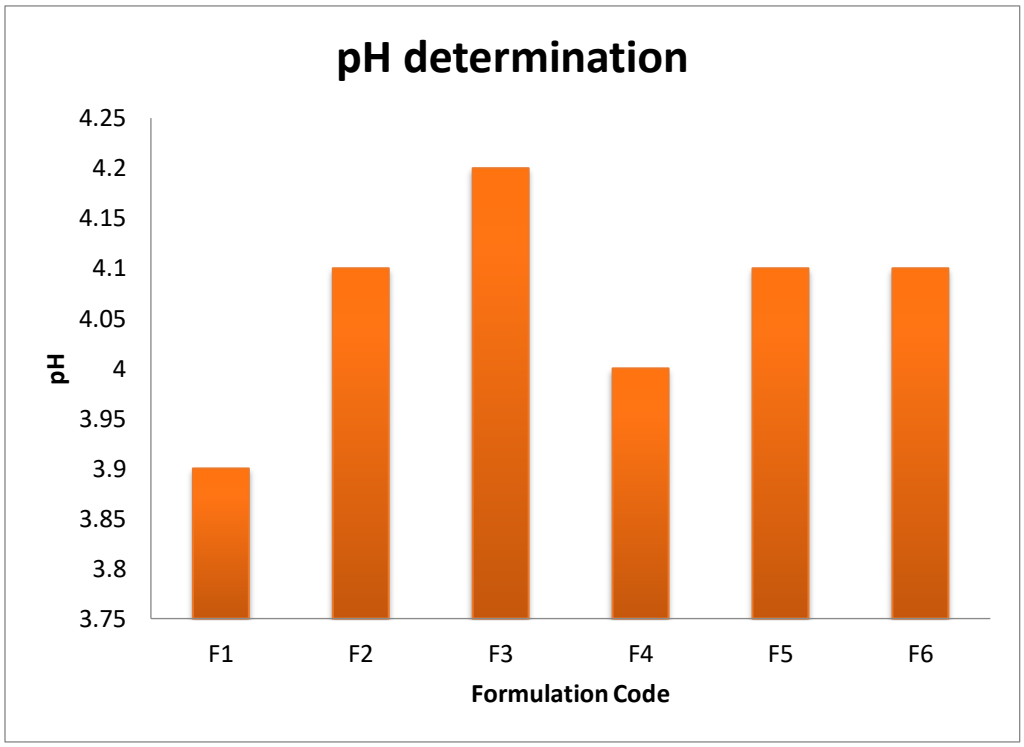

Figure 3 pH of different formulation

4 Drug Content Uniformity

Table 4 Result of Drug Content Uniformity

S. No.	Formulation Code	% Drug Content
1	F1	91.24
2	F2	93.10
3	F3	95.25
4	F4	87.42
5	F5	89.18
6	F6	90.20

Discussion: Drug content of prepared formulations were observed with the help of UV spectrophotometer. Experimental results suggest all the formulation having higher value of drug content within the range of 87.42-95.25%. Drug content of formulation are shown in table 5.12 and fig 5.12

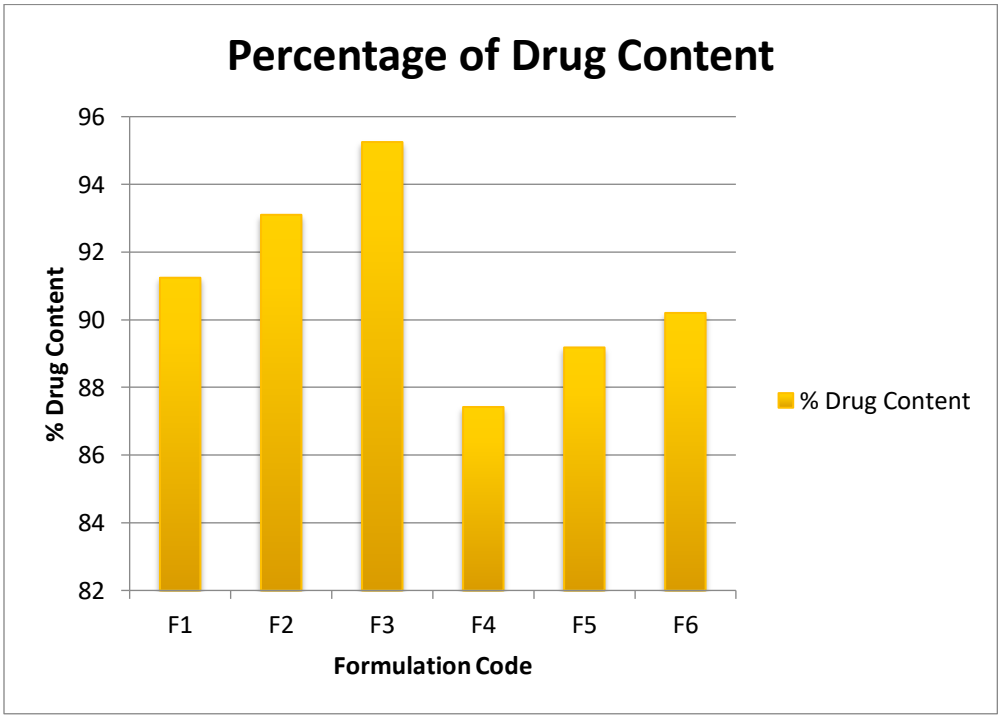

Figure 4 Result of Drug Content Uniformity

5 Antimicrobial activity

Table: 5 Zone of inhibition obtained from antimicrobial study

Organism	**Zone of inhibition (cm) of formulation**		
	F3	Std	MARKETED(MR)
Gram +ve (E.coli)	1.2	1.3	0.9
Gram –ve (S.aures)	1.5	1.7	0.9

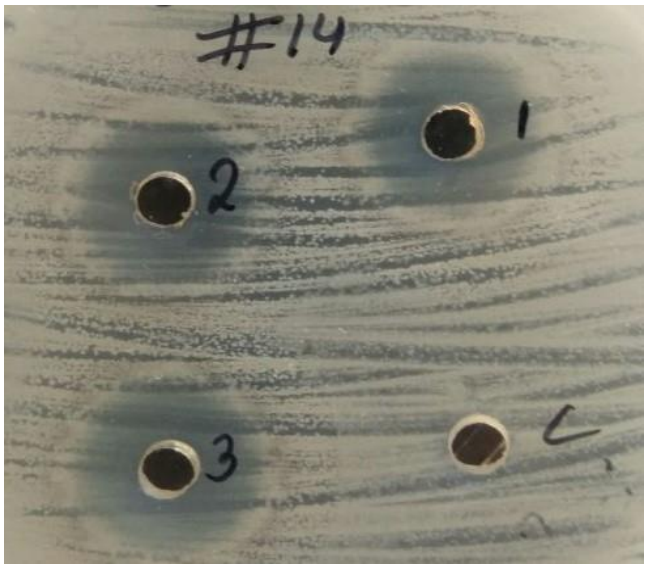

Figure: 5.1 Zone inhibition with drug silver sulfadiazine

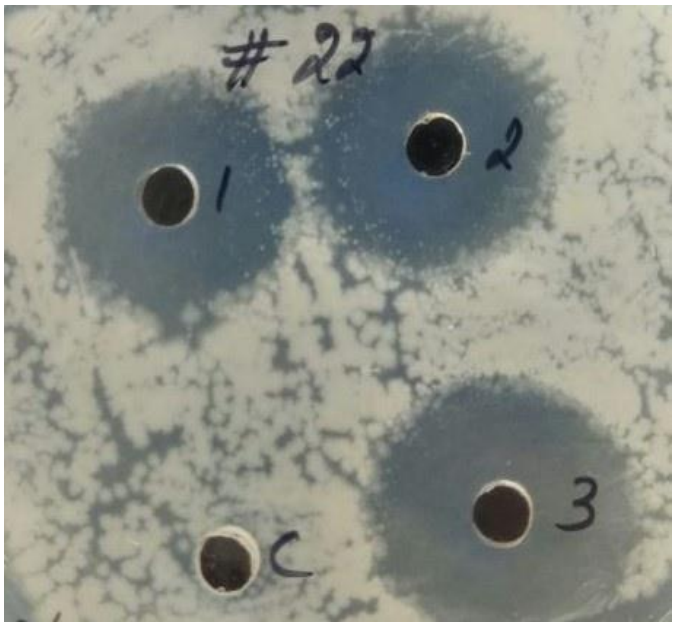

Figure: 5.2 After 24 hr Zone inhibition with combination of silver sulfadiazine

Discussion: Antimicrobial activity of silver sulfadiazine When compared with marketed SSD cream, F3 formulation showed greater zone of inhibition for gram positive and gram-negative microorganism. The formulation F3 prepared from PVA, PVP combination (20%) was found to be more active against both gram positive and gram-negative microorganisms. It showed greater zone of inhibition in comparison with marketed formulation. This might be due to the improved solubility of silver sulfadiazine in presence of PVA and PVP. The polymers PVA and PVP were known to increase wettability of the hydrophobic drugs and there by showed enhanced antimicrobial activity in agar well diffusion method. More over in silver sulfadiazine, the silver ions were highly reactive and affect multiple sites within bacterial cells, ultimately causing bacterial death. Since the formulation F3 showed maximum zone of inhibition, it was selected as optimized formulation.

CONCLUSION:

The aim of the present work was used to prepare, evaluate and optimise topical formulation of Silver Sulfadiazine for burn wound. Burn injuries are very complex and associated with large amount of inflammation that can lead to worsening of the tissue damage caused by the initial thermal injury. Among the novel formulations to be applied on the damaged skin, hydrogels have shown the superiority as they can provide a moist environment for the wounds or burns and at the same time deliver the incorporated drug to the burn site. Silver sulfadiazine is the drug of choice for the treatment of burn wounds, as it possesses broad spectrum of activity against microorganisms. The antimicrobial property was mainly due to the release of silver ions. The application of film forming hydrogel incorporated with silver sulfadiazine (formulation F3) to the burn site has the ability to transform to a flexible, occlusive, and a protective film with the release of silver sulfadiazine for 24 hrs. This enhances the wound healing property along with improved patient compliance.

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