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Design And Development Of Herbal Tablet Containing Ethanolic Extract Of Diplocyclos Palmatus (L.) Jeffry. For The Treatment Of Inflammation

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***Abstract**: Diplocyclos palmatus (L.) Jeffry. commony known as Shivlingi belongs to family Cucurbitaceae had been widely used for its reported biological activities in indigenous system of medicine. The present investigation was designed to develop herbal tablet containing ethanolic extract of leaves of Diplocyclos palmatus (L.) Jeffry. for the treatment of inflammation. The developed herbal tablet was evaluated as per IP. Hence, present investigation established pharmacological evidences to support the folklore claim that Diplocyclos palmatus (l.) Jeffry. is used as anti-inflammatory agent.*

Key-words: Diplocyclos palmatus (L.) Jeffry., Leaves, Inflammation

INTRODUCTION

Diplocyclos palmatus is commonly known as Shivalingi, belongs to family Cucurbitaceae, is an annual, herbaceous climber, growing up to a height of 3-4 m. Leaves are alternate, broadly ovate, palmately 3-7 lobed, 3.5-14 x 4-14.5 cm, lobes linear-lanceolate to elliptic, glabrous; margins often irregularly toothed petiole 1.5-9.0 cm long. The plant is used by the various tribal communities of India in the treatment of various disease and disorders.[1] Inflammation is a local response of living mammalian tissues to the injury. It is a body defense reaction in order to eliminate or limit the spread of injurious agents. There are various components to an inflammatory reaction that can contribute to the associated symptoms and tissue injury. Oedema formation, leukocyte infiltration and granuloma formation represent such components of inflammation[2]. The plant selected was widely used for the treatment of inflammation as mentioned in folk-lore. Keeping this view the present work was conceived to develop herbal tablet containing ethanolic extract of *Diplocyclos palmatus* leaves.

MATERIAL AND METHODS

Preparation of Extract

The shade dried coarsely powdered leaves of *D. palmatus* (250gms) were loaded in Soxhlet apparatus and was extracted with ethanol until the extraction was completed. After completion of extraction, the solvent was removed by distillation. The extracts were dried using rotator evaporator.[3]

Characterization of Extract: The color, odor, taste and pH of the extracts were recorded.

Pre-Formulation Studies: Blended: Preformulation studies were determined as per standard protocols.[4]

Preparation of herbal tablets from extract (Direct compression technique)
Herbal tablets were prepared separately by direct compression process using different proportions of excipients and EEDPL- 1 to 8. The composition of various formulations was given in Table 1. All the ingredients were passed through mesh. The powder mixtures possess good flow properties. Thus, the mixtures were directly compressible. Tablets were compressed each of 250 mg weight on a 10-station Mini Press-I rotary tablet compression machine fitted with 6-mm flat-shaped punches.[5]

Table 1: Formulation of herbal tablet of *D. palmatus* containing ethanolic extract of leaves

Ingredients	**Formulation Code (EEDPL)**							
	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
EEDPL	100	100	100	100	100	100	100	100
Spray Dried Lactose	126	123	120	117	126	123	120	117
Talc	0	0	0	0	15	15	15	15
Potato Starch	9	12	15	18	9	12	15	18
Mg Sterate	15	15	15	15	0	0	0	0
Total Weight	250	250	250	250	250	250	250	250

All quantities are in mg

Evaluation of dosage form[6-9]

General appearance (Organoleptic Properties)
The tablets were examined for their color and appearance. The color, odor, taste were observed and noted down.

Tablet Hardness
The crushing strength Kg/cm^2 of prepared tablets was determined for 10 tablets of each batch by using Monsanto tablet hardness tester. The average hardness and standard deviation was determined.

Friability
Twenty tablets were weighed and placed in the Electrolab friabilator and apparatus was rotated at 25 rpm for 4 minutes. After revolutions the tablets were dedusted and weighed again. The percentage friability was measured using the formula.

$$\% F = \{1-(W_t/W)\} \times 100$$

Where, % F = friability in percentage, W = Initial weight of tablet, W_t = weight of tablets after revolution.

Weight Variation
The tablets were evaluated as per I.P., 1996 for weight variation (n = 20) using 1mg sensitivity balance.

Disintegration Time

Disintegration time of the tablet was measured in water (37^0C) using USP disintegration test apparatus. A glass of plastic tube 80-100 mm long with an internal diameter of about 28 mm and external diameter 30-31 mm fitted at the lower end with a disc of rust proof wire gauge. Six tablets were placed in the tube, raise and lower the tube in such a manner that the complete up and down movement is repeated 28 to 32 per minute. The tablets are disintegrated when no particles remains above the gauge, which readily pass through mesh (10 mesh screen).

Content Uniformity

Five randomly selected tablets were weighed and powdered. The powdered tablet equivalent to 100 mg drug in one tablet was taken and transferred in a 100 ml flask containing 100 ml of 0.1 N HCl pH 1.2. The flask was shaken on a flask shaker and was kept for few hours for the sedimentation of un-dissolved materials. The solution is filtered through Whatman filter paper. 10ml of this filtrate was taken and appropriate dilution was made. The samples were analyzed at specific wavelength using UV visible spectrophotometer. The drug content was determined from the standard curve prepared at optimum λ max.

In-Vitro Dissolution Studies (Drug Release)

Drug release was assessed by dissolution test under the following conditions: n = 6 (in triplicate), USP type II dissolution apparatus (Lab India, DISSO 2000) at 50 rpm in 900 ml of 0.1N HCl pH1.2 maintained at 37 ± 0.5˚C. The tablet was allowed to sink to the bottom of the flask before stirring. Special precaution was taken not to form air pockets on the surface of the tablet. Five milliliters of the sample was withdrawn by using a syringe filter at regular intervals and replaced with the same volume of pre warmed (37 ± 0.5°C) fresh dissolution medium. The drug content in each sample was analyzed after suitable dilution using UV spectrophotometer method at respective maximum wave length.

Stability Studies

The success of an effective formulation can be evaluated only through stability studies. The purpose of stability is to obtain a stable product which assures its safety and efficacy up to the end of shelf life at defined storage conditions and peak profile.

The optimized formulation of the drug was subjected to accelerated stability studies at specified conditions of temperature and relative humidity of 25^0C/60% RH, 30^0C/60% RH and 40^0C/75% RH for 3 months.[9]

RESULTS AND DISCUSSION

Characterization of Extract

EEDPL were selected for formulation of herbal tablets. The organoleptic properties of the extract before formulation were studies and were reported such as color, odor, taste and pH and were presented in table 2.

Standard curve of extract

Standard calibration curve of extract EEDPL were determined by plotting graph between absorbance v/s concentration on double beam U.V. spectrophotometer using λmax at 280 nm, it follows the Beer's law. Straight line was obtained after plotting absorbance on X axis and concentration on Y axis. The line of equation was Y= 0.010X+0.175 and the R^2 value found was 0.987.

Table 2: Organoleptic properties of extract *Diplocyclos palmatus* (L.) Jeffrey

S/No.	Parameters	Extract
		EEDPL
1.	Color	Light Brown
2.	Odor	Intense
3.	Taste	Acceptable
4.	pH	7.01

Table 3: Data of standard curve for EEDPL at λmax at 280 nm

S/No	Conc. (µg/ml)	Absorbance
1	10	0.280
2	20	0.399
3	30	0.471
4	40	0.628
5	50	0.699

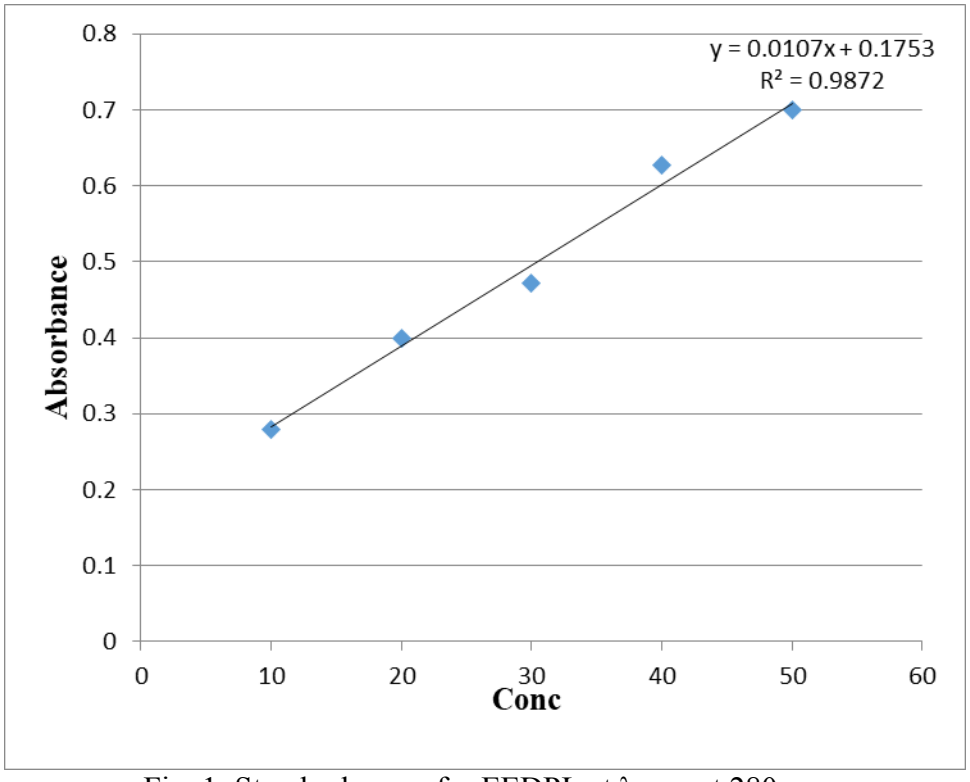

Fig. 1: Standard curve for EEDPL at λmax at 280 nm

The extract EEDPL along with various excipients selected were mixed according to the formula in eight batches (F1 to F8) and various pre-formulation studies such as bulk density, tapped density, carr's index, hausner's ration and angle of repose were recorded. The data were presented in table 4. It was found from the present investigation that all the studied parameters were within the limit for all the formulation batches. The formulated tablets observed for defects and no any tablet defects were observed in all the formulations. All the formulations of tablets EEDPL were evaluated and the results were presented.

Table 4: Pre-compression parameters of Formulation containing EEDPL

Parameters / Formulation Code	Bulk density (gm/ml)	Tapped density (gm/ml)	Carr's index (%)	Hausner's ratio	Angle of repose
F1	0.543	0.583	6.86	1.07	26.88
F2	0.566	0.613	7.66	1.08	26.30
F3	0.482	0.523	7.83	1.08	25.92
F4	0.533	0.597	10.72	1.12	24.32
F5	0.544	0.593	8.26	1.09	22.11
F6	0.521	0.585	10.94	1.12	22.57
F7	0.562	0.611	8.01	1.08	25.19
F8	0.582	0.661	11.95	1.13	24.53

Table 5: Organoleptic properties of Formulations containing EEDPL

Parameter	**EEDPL**							
FC	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Color	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown
Odor	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant
Taste	Good	Good	Good	Good	Good	Good	Good	Good

Table 6: Evaluation Parameters of Formulation containing EEDPL

Parameter	**EEDPL**							
FC	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Hardness (kg/cm^2)	5.2	4.9	4.8	5.0	4.4	4.8	4.9	5.1
Friability	0.71	0.73	0.67	0.69	0.50	0.55	0.72	0.81
Weight variation	±4.9	±4.83	±4.99	±4.53	±4.32	±4.91	±5.01	±5.10
DT	22.10	25.20	30.15	45.15	12.20	18.30	22.10	30.15
DC	93.29	94.10	95.89	96.96	97.01	96.30	96.01	94.29

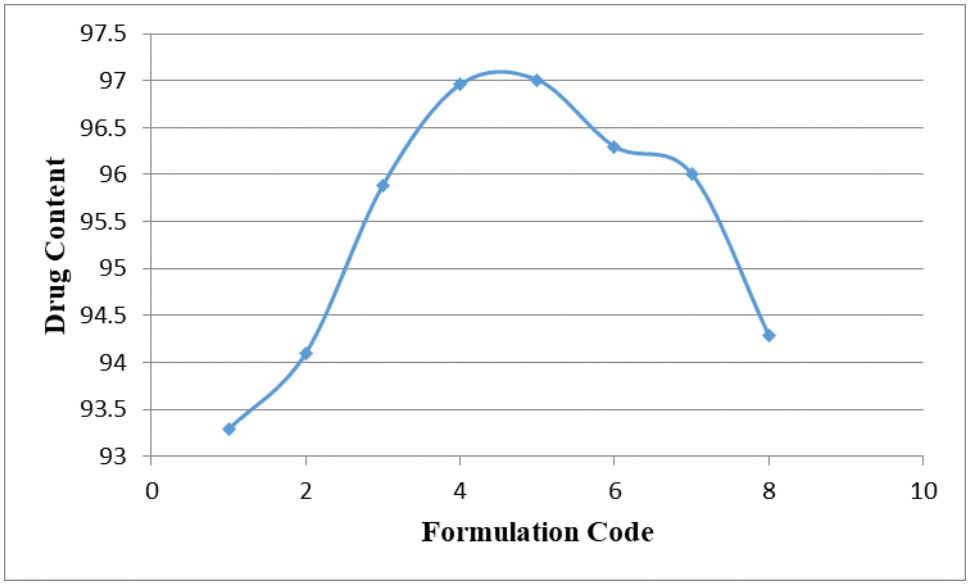

Fig. 2: Drug content of formulation containing extract of EEDPL

Table 6: *In-Vitro* drug release of Formulation containing EEDPL

S/No.	Time (Mts)	% Drug Release							
		F1	F2	F3	F4	F5	F6	F7	F8
1.	0	0	0	0	0	0	0	0	0
2.	10	41.23	42.62	45.71	44.39	44.51	43.42	43.29	42.19
3.	20	61.89	68.30	74.29	71.26	79.86	69.61	67.89	74.39
4.	30	83.20	80.50	89.60	89.64	87.92	78.83	74.29	79.40
5.	40	96.61	95.91	94.81	94.99	97.96	96.48	94.20	91.95

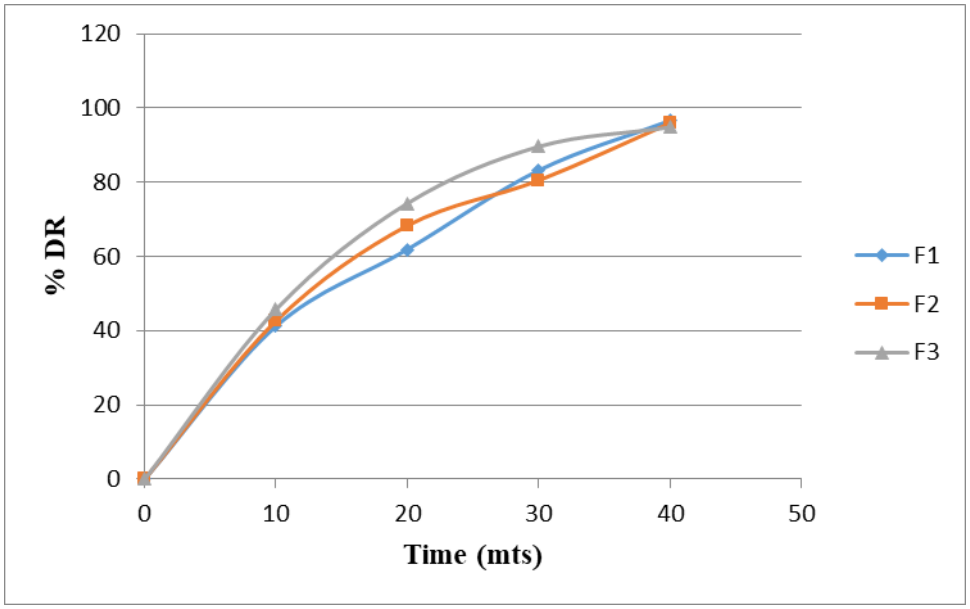

Fig. 3: Drug release of formulation containing extract of EEDPL (F1 to F3)

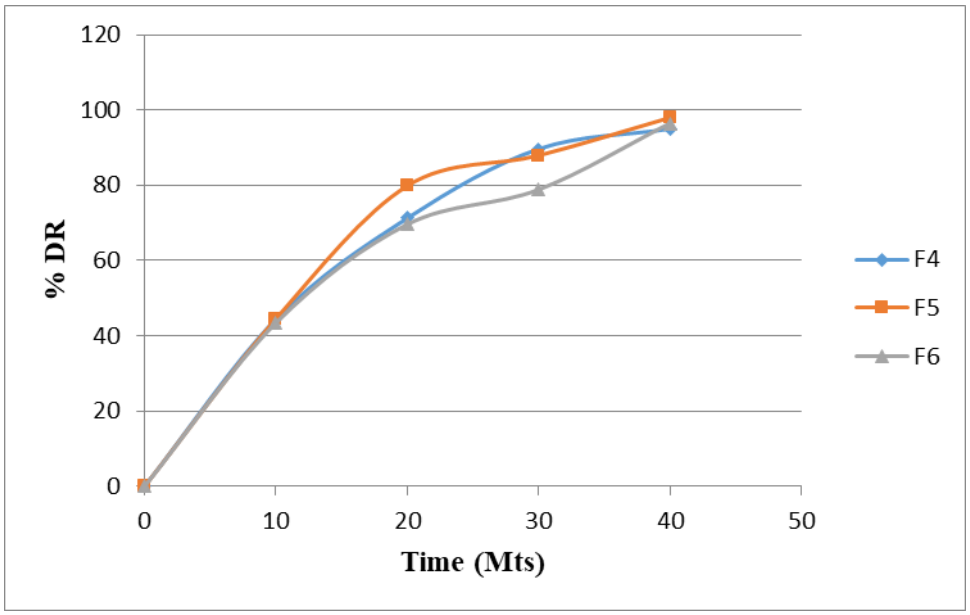

Fig. 4: Drug release of formulation containing extract of EEDPL (F4 to F6)

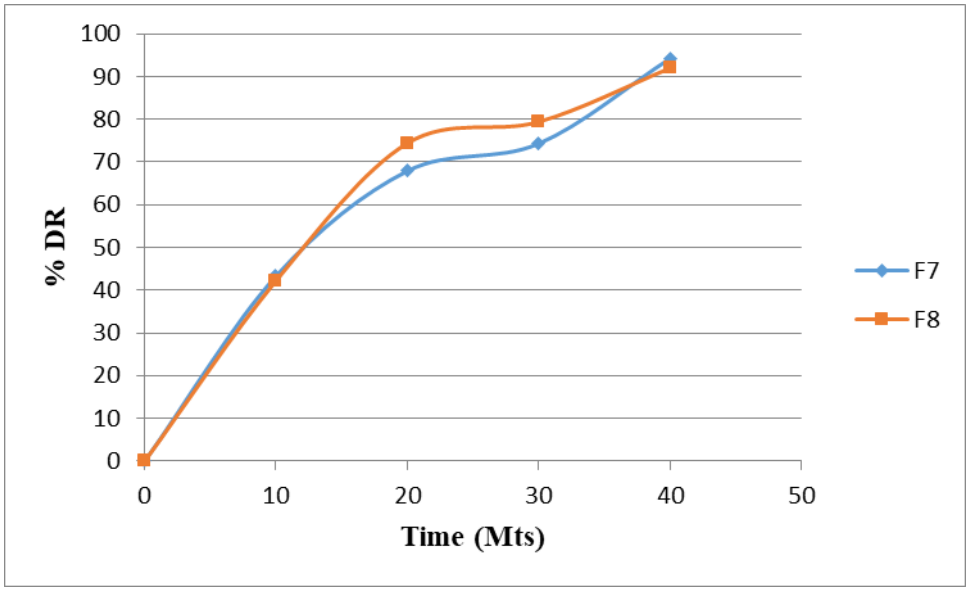

Fig. 5: Drug release of formulation containing extract of EEDPL (F7 to F8)

The optimized formulation of the drug from EEDPL i.e., F5 was subjected to accelerated stability studies at specified conditions of temperature and relative humidity of 25^0C/60% RH, 30^0C/60% RH and 40^0C/75% RH for 3 months. The results were presented below

Table 7: Evaluation parameters of optimized formulation at 25^0C ± 2^0C/ 60% ± 5% RH

S/No.	Evaluation Parameters	Formulation Code	
		EEDPL	
		Initial	Final
1.	Hardness	4.4	4.9
2.	Friability	0.50	0.55
3.	Weight variation	±4.32	±4.89
4.	Disintegration time	12.20	15.10
5.	Drug Content	97.01	96.15
6.	*In-Vitro* drug release	97.96	96.18

Table 8: Evaluation parameters of optimized formulation at 30^0C ± 2^0C/ 65% ± 5% RH

S/No.	Evaluation Parameters	Formulation Code	
		EEDPL	
		Initial	Final
1.	Hardness	4.4	4.9
2.	Friability	0.50	0.59
3.	Weight variation	±4.32	±4.91
4.	Disintegration time	12.20	15.30
5.	Drug Content	97.01	96.10
6.	*In-Vitro* drug release	97.96	96.02

Table 9: Evaluation parameters of optimized formulation at $40^0C \pm 2^0C$/ 75% ± 5% RH

S/No.	Evaluation Parameters	Formulation Code	
		EEDPL	
		Initial	Final
1.	Hardness	4.4	4.9
2.	Friability	0.50	0.61
3.	Weight variation	±4.32	±4.93
4.	Disintegration time	12.20	15.40
5.	Drug Content	97.01	96.04
6.	*In-Vitro* drug release	97.96	95.96

CONCLUSION

The various composition of the prepared herbal tablet formulations containing EEDPL were prepared and evaluated. The micromeritic properties were determined for all the physical mixtures. The results of angle of repose, Carr's Index and Hausner ratio indicated that the powder mixtures possess good flow properties and good packing ability. The physical property of tablet was determined and the results of the uniformity of weight, hardness, drug content and friability of the tablets were determined and found within the limit. All the samples of the test product complied with the official requirements of uniformity of weight. The drug content was found to be close to 100% in all formulations. The low friability indicates that the herbal tablets are compact and hard. On the basis of results obtained after evaluation of herbal tablets F5 of EEDPL were optimized and selected for the stability studies for three month duration at 25^0C/60% RH, 30^0C/60% RH and 40^0C/75% RH. The results are reproducible, even on tablets that had been stored for 3 months at 25ºC, 30 ºC & 40 ºC and at relative humidity.

From the results of stability studies it was revealed that the F5 of EEDPL at same condition than that of other two conditions selected for the investigation. Hence, it was concluded from the present work that the herbal tablet containing EEDPL has promising effect in the treatment of inflammatory conditions.

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