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Research Article

Study on anti-solar activity of *Solanum lycoperisium* and *Pisum sativum* fruit

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Abstract

Skin cell regeneration and contributes to all overseen of well being of individual. The sunlight which also stimulates melanin and the pigment that acts as the skin natural sunscreen. But excessive radiations of sunrays are unprotected and leading to painful sunburn or other skin related complication. This study evaluates on UV absorption ability of *Solanum Lycoperisium* fruit an anti-solar agent. The extract was prepared with 90% ethanol by maceration process. The method was performed by UV visible spectrophotometer in the range of 200-400 nm. The finalize result of extract was reported as maximum absorbance at 200 nm while good absorbance at 260 to 300 nm. The moderate absorbance at 300 – 400 nm.

Keywords: Antisolar, *Pisum sativum*, *Solanum Lycoperisium.*

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1. Introduction

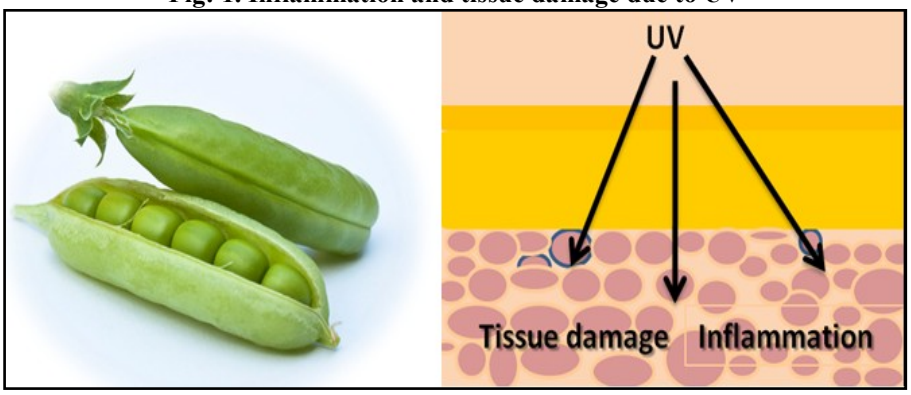
The use of sunscreen as photo protecting agents for UV protection is becoming very popular. A sunscreen preparation is defined as a formulation which when applied topically protects the treated area from sunburn. Sunscreens are used to aid body natural defence mechanism to protect against harmful UV radiation from sun. Its function is based on its ability to absorb, reflect or scatter the sun rays. SPF of sunscreen is calculated by comparing the amount of time needed to produce sunburn on sunscreen protected skin to amount of time needed to cause sunburn on unprotected skin. Efficacy of sunscreens depends upon ability to protect against UV induced sunburns and their chemo preventative activity.

1.1 Exposed sun the solar spectrum radiation of the sun is divided into five regions:

Ultraviolet Cor UV-C (from 100 nm to 290 nm), Ultraviolet B or UV-B (from 290 nm to 320 nm), Ultraviolet A or UV-A (from 320 nm to 400 nm), visible (from 380 nm to 780 nm) and infrared (from 780 nm to 106 nm) [2]. The high proportion of UV – radiation is reflected than in summer [3]. Prolong exposure to UV radiation may initiate the production of reactive oxygen species, which causes oxidative injury and impairment of the antioxidant system. These injuries impair the metabolic path ways of the skin, which lead to photo aging, erythema, edema, sunburn, lines, wrinkles, photosensitivity.

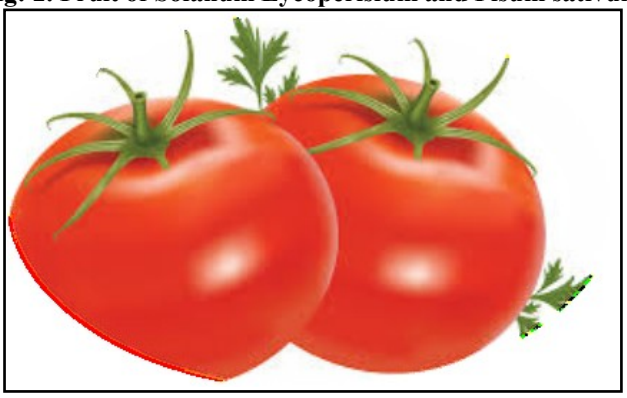
SPF is defined as the ratio of minimal erythema dose (MED) of solar radiation measured in the presence and in the absence of a sunscreen agent [4]. The MED is defined as the lowest time interval or dosage of UV light irradiation sufficient to produce a minimal, perceptible erythema on the unprotected skin [11] herbal botanical sunscreens are safe, widely accepted by consumers and also work in various ways, playing multiple roles in ameliorating the process of carcinogenesis [5]. Flavonoids such as quercetin, luteolin, and catechins are better antioxidants, were reported to be effective in UVA and UVB range [6**].**

Fig: 1. Inflammation and tissue damage due to UV



Solanum Lycoperisium fruit is the major source of lycopene and studied for its antioxidant activity. Lycopene is carotenoid is not merely pigment but having powerful antioxidant capacity, neutrilzes free radical especially those derived from oxygen present under skin. It prevents erythema caused by UV radiation on the skin. It also reduces the damaging effect of UV light on the skin and boost protection against both short term sunburn and cumulative effect of sun exposure. The active phytochemical substances of *P. sativum* are contains Asparaginase, flavonoids, phenolic which is having antioxidant properties. Also several studies have suggested the cytotoxicity or tumor inhibition mechanisms of lectins to various tumor cell lines such as skin.

Fig: 2. Fruit of Solanum Lycoperisium and Pisum sativum



2. Material and method

The Fruit of *Solanum Lycoperisium and Pisum sativum* were collected from Warananagar market. The samples were authenticated Department of Botany, Yashwantrao Chavan Warana Mhavidyla. The photographs of the fruit and seeds were depicted in fig: 1. and fig: 2. The collected fruit and seed material cleaned by distilled water cut into small pieces and dried by circulating cool air. The sample was dissolved in ethanol and methanol, were subjected to 4 different concentration variations. Following concentarions were made:

Table 1: Extraction solvent system

Sr. No.	Name of sample	Solvent
1	*Solanum Lycoperisium*-250g	Ethanol (500 ml)
2	*Pisum sativum* -250g	Ethanol (500 ml)
3	*Solanum Lycoperisium*-250g	Methanol (500 ml)
4	*Pisum sativum* -250g	Methanol (500 ml)

The fruit and seed materials were subjected to Maceration for 8 days by using methanol and ethanol as solvents. After maceration filter the extract with help of whatmann's filter paper and collect the extract in beaker. Keep it for evaporation of methanol and ethanol with help of Soxhlet's evaporator up to formation of liquid extract. Collect the liquid extract into porcelain dish and freeze it.

2.1 Formulation of Herbal Suncreen Gel

2.1.1 Formulations

For the chemical stability study, gel formulation containing extract *Solanum Lycoperisium* and *Pisum sativum* with final concentration of 0.1% (w/w) and 1.5% (w/w) of carbomer 973 was prepared. All formulations were stored in well-closed dark glass flasks and were compounded fresh for all studies. The concentration was the minimal active antioxidant concentration. A formulation was prepared with the addition of active ingredient % (w/w) which is shown in Table 2.

Table 2. Formulation table with extract

Sr.No	Formulation	Tom(e)	Tom(m)	Cpe(e)	Cpe(m)
1	F-1	✓	-	-	-
2	F-2	-	✓	-	-
3	F-3	-	-	✓	-
4	F-4	-	-	-	✓
5	F-5	✓	-	✓	-
6	F-6	-	✓	-	✓

Physciochemical Paramter of formulate gel were determined according to the standard method which is shown in Table 3.

Table 3. Physciochemical Paramter of Formulated Gel

Sr. No.	Parameters	% w/w (±) S.D.
1	Foreign organic matter	0.047 % ± 0.211
2	Methanol soluble extrative	13.21 % ± 0.3977
3	Water soluble extrative	39.25 % ± 1.524
4	Total ash	5.57 % ± 0.258
5	Acid-soluble ash	1.68 % ± 0233
6	Acid-insoluble ash	9.1 % ± 0.977
7	Loss on drying	4.45 % ± 0.285
8	Moisture content	9.19 % ± 0.168

2.1.2 Chemical Stability

The stability study of *S. lycoperisium* and *P. sativum* extract over time and influence of temperature on degradation of *S. lycoperisium* and *P. sativum* extract gel without and in the presence of antioxidants were investigated. Gel formulation were stored in well closed dark bottle container under different conditions: 5, 25 and 45^0 C (± 1^0C). The amount of food extract in sample was quantitively determined at 2 to 3 months for stability study. 1ml of distilled water and 10 ml of hexane were added to 50 mg of sample. A fraction of hexane layer was evapourated under nitrogen, dissolved in methanol and analysed by HPLC with electrochemical detection.

2.1.3 Determination of invitro SPF

The in vitro method measures the reduction of the irradiation by measuring transmittance after passing through a film of product. As in the operative conditions of the transmission measurement are correct, this to be a very precise and single value, always reproducible for the same product and expressed as a single UV curve, in the percent transmittance or absorbance scale (Fig. 1). The crude *S.lycoperisium* and *P.sativum* extract, the gel formulation (1.5% carbomer 937) containing *S. lycoperisium* and *P.sativum* extract were analyzed for the in vitro SPF. The crude *S.lycoperisium* and *P. sativum* extract gel formulation was dissolved in meth-anol UV solvent:water (6:4). Scans of the samples in solution were run from 320 to 290 nm using 1 cm quartz cuvettes in a Shi-madzu UV-1700 spectrophotometer. The commercial sun-screens, Himalaya SPF 15, were used for the calculation of the correction factor and a solution of 8% homosalate (v/v) diluted to 0.2 mg/ml was used as standard. The SPF model used in this study was based on the following equation proposed by Mansur et al.[7]

$$\text{SPF} = \sum_{k=290}^{320} \text{EE}\lambda\text{xI}(\lambda)\text{x abs}(\lambda)$$

where CF is correction factor, determined by sunscreens with known SPF, so that a solution containing 8% of homosalate gives SPF ¼ 8; EE (l) the erythemal efficiency spectrum; I (l) the solar simulator spectrum as measured with a calibrated spectroradiometer;

$$\sum_{k=290}^{320} \text{EE}\lambda\text{xI}(\lambda) = 290 - 320 \text{ nm}$$

where, 290-320 nm in 5 nm increments; abs (l) is the spectro radiometer measure of sunscreen product absorbance

2.2 Phytochemical Test:

Table 4. Phytochemical test

Sr. No.	Test	Method	Inference
1	Glycosides	2ml extraxt+1ml feling solution in test tube and place in water batch at 60 ^{0}C	Brick red colour
2	Alkaloids	0.5g extraxt+ 5ml aqueous HCL on water bath+	Orange red colour
3	Tannins	5g extract+ 10ml distilled water and filter it + add ferric chloride reagent	Dark green or deep blue colour
4	Saponins	1ml test residue+sodium bicarbonate+ water	Honeycomb like froth
5	Flavonoid	Test residue+ 5ml ethanol+ conc. HCL+0.5g magnesium metal.	Pink, crimson or magenta colour

3. Result and discussion

3.1 Chemical stability of S. lycoperisium and P. sativum extract gel formulation

The chemical stability *S.lycoperisium* and *P.sativum* extract gel was determined at different concenctration and storage temperature 5, 25 and 45^0 C for 103 days. The final concentration was expressed as micrograms extract per gram of gel formulation. All the samples stored at 5 and 25^0 C were stable over time of experiment 103 days. All of them showed an intial decrease 20% between days 0 and 1 and then finally remain constant over time. The sample stored at 45^0 C were stable for 7 days but then degradation of gel structure was observed.[8]

3.2 Determination of correction factor

The correction factor was calculated for commercial sunscreen (Himalaya SPF 15) by using Eq. 1 SPF value given in Table 6.

Table 6. The normalized product function used in the calculation of SPF data

Sr. No.	λ (nm)	*EE x *I* (normalized)
1	290	0.0150
2	295	0.0817
3	300	0.2874
4	305	0.3278
5	310	0.1864
6	315	0.0839
7	320	0.0180
-	-	=1.000

*EE: erythemal efficiency spectrum; *I*: solar simulator intensity spectrum

3.3 Determination of SPF in the S. lycoperisium and P. sativum extract gel formulation:

According to table 7 summarizes the SPF values determined for each solution described. As expected . invitro SPF values for *S.lycoperisium* and *P. sativum* extract was 1.32±0.1. When 1.5% for *S. lycoperisium* and *P. sativum* extract was added to the cabapol 934 gel formulation, the SPF value was 3.79±0.05.[9]

Table 7: Summerized SPF Value

Sr. No.	λ (nm)	*EE x *I*(Normalized)	Himalaya SPF 15	
			Absorbance	SPF
1	290	0.0150	07943	0.0198
2	295	0.0817	0.7723	0.0676
3	300	0.2874	0.7625	0.2145
4	305	0.3278	0.7443	0.2434
5	310	0.1864	0.7167	0.1356
6	315	0.0839	0.6906	0.0578
7	320	0.0180	0.6688	0.0199
8	Total	-	-	0.7586

*EE:erythemal efficiency spectrum; *I:* solar simulator intensity spectrum

Table 7 SPF calculated for commercial sunscreens (Himalaya SPF 15) using Eq. (1) and data given in Table 8.

Table 8: Summerized SPF Value

Sr. No.	Plant Name	Conc.	Abs	SPF
1	Tomato (methanol)	8mg/100ml	0.344	1.32
		10mg/100ml	0.683	2.90
2	Tomato (ethanol)	8mg/100ml	0.512	1.81
		10mg/100ml	0.498	2.01
3	Common peas A (methanol)	8mg/100ml	0.741	1.12
		10mg/100ml	0.259	1.02
4	Common peas B (methanol)	8mg/100ml	0.867	3.79
		10mg/100ml	0.587	1.85

Table 8 results expressed as the average and S.D. of three determination replicated of the SPF values.

3.4 Photostability of the isolated S.lycoperisium and P.sativum extract:

A methanol solution of 10µg/ml *S.lycoperisium* and *P.sativum* extract was irradiated with a UV B lamp. Absorbance spectra of *S. lycoperisium* and *P. sativum* extract solution were stable over time of irradiation (Fig: 3). Here absorbance of mm ethanol solution of 10µg/ml *S.lycoperisium* and *P.sativum* extract (A) just after preparation and (B) after 3 weeks of UVB irradiation. All values are means of 3 replicated expremients. The concentration difference between times was considered not siggnificant in the statistical analysis. [10]

Fig: 3. Inflammation and tissue damage due to UV

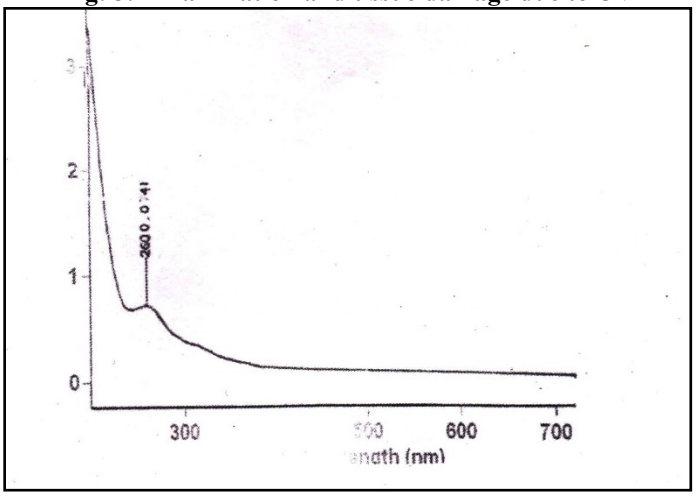
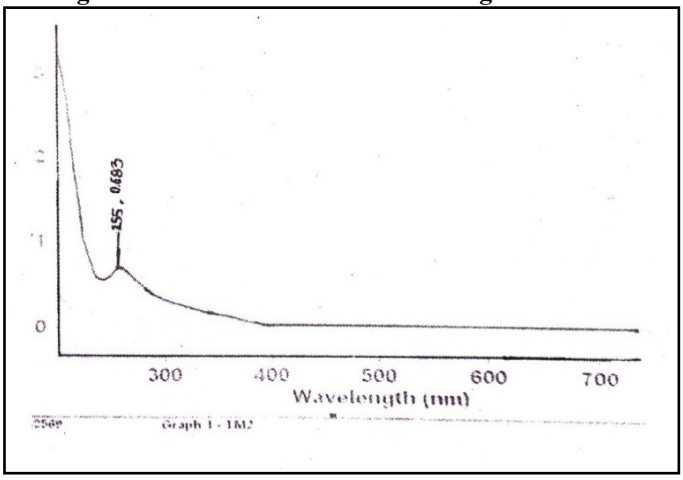


Fig: 4. Inflammation and tissue damage due to UV



4. Conclusion

The result obtained were showed that ability of extract to absorb UV radiation and hence proved UV protection ability. This study has shown that *S.lycoperisium* and *P.sativum* extract gel is stable for at least 2 to 3 months when stored at 5 and 25^{0}C. Further isolated extract have major antioxidant of Tomato and bean is also stable when exposed to UVB irradiation. This proved activity of plant showed its importance and prophylactic utility in anti-solar formulation. This will be a better, chaeaper and safe alternative to harmful chemical suncreens that are used now days in industry.

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Conflict of intrest: Not declared

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