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Original Research Article

Phytochemical Screening, Characterization and Formulation and Evaluation of Herbal Gel of *Matricaria chamomilla*

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Abstract:

The total ash value was found to be 6.42 % w/w indicating the considerable presence of inorganic radicals. The acid insoluble ash was found to be 1.16 %w/w. The water soluble ash value was found to be 1.6 %w/w. and the moisture content was found 2.01%. Percentage yield of all extract of leaves of *Matricaria chamomilla* were determined. The alcohol soluble and water soluble extractive values were found to be 7.21% w/w and 12.6% w/w respectively. It shows that water soluble extract having higher constituents as comparison to alcohol soluble extract. The moisture content of the drug was determined by the Loss on drying (LOD) method. It was found to be 2.01% w/w. Gel was prepared by cold mechanical method described by Lalit K et al, 2010. Required quantity of polymer (HPMC) was weighed and it was sprinkled slowly on surface of purified water for 2 hrs. After which it was continuously stirred by mechanical stirrer, till the polymer soaked in the water. Triethanolamine was added with continuous stirring to neutralize the gel and it maintains the pH of the gel. Then the appropriate quantity of DMSO (Dimethyl sulfoxide) was added to the gel, which behaves as the penetration enhancer, followed by the required quantity of methyl paraben as a preservative. Finally the *Matricaria chamomilla* extracts, Menthol, Linseed oil were added to the gel with continuous stirring till all the ingredients get dispersed in gel completely.

Key words: Herbal Gel, *Matricaria chamomilla,* extrudabilty, spreadibility.

1. INTRODUCTION:

Herbs are used as medicine by about 80% of the world population, mainly in the developing countries, for primary healthcare because of better cultural acceptability, better compatibility with the human body and lesser side effects. India is one of the countries in the world today where ancient system of medicine, such as Ayurveda, Siddha, Unani, Tribal medicineand Naturopathy have been in practice for several years [1].

In western world also, th e use of herbal medicines is steadily growing with approximately 40 percent of population [2], reporting use of herb to treat medical illnesses in 2004 [3]. Public, academic and government interest in traditional medicines is growing exponentially due to the increased incidence of the adverse drug reactions and economic burden of the modern system of medicine [4]. The skin

becomes more susceptible for the internalization of numerous allergens due to disturbed epidermal barrier function and dryness, along with other adverse environmental factors. This action triggers and provokes allergy with one more episode of inflammation and barrier integrity alteration (Leung et al.; Scharschmidt and Segre). Therefore, dry skin is one of the most prominent factor in damaging the skin and also contributes in pathogenesis of AD (Bouwstra, de Graaff, et al.). It could be said that barrier function restoration is essential while designing prevention plan and aggravation of AD.

2. MATERIALS AND METHODS:

Entire plants of *Matricaria chamomilla* was collected from agriculture region of Rajsamand district. The plant was authenticated by Dr. K.B. Sukla (botanist) Principal, Shrinathji Agriculture College, Nathdwara. A voucher specimen is preserved in our laboratory for future reference (Voucher No.: DSPSC/2022-23/013).

Figure 1: *Matricaria chamomilla* plant

Preparation of plant material:

The Leaves of plant were shade dried, reduced to coarse powder with the help of grinder and stored in airtight container till further use [5]. The leaves of *Matricaria chamomilla* plants were shade dried, reduced to coarse powder with the help of grinder and stored in airtight container till further use.

Determination of Water Soluble Extractive Value:

Weigh accurately the 10 gm of coarsely powdered drugs and macerate it with 100 ml of water in a closed flask for 24 hours, shaking frequently during the first 6 hours and allowing standing for 18 hours. Thereafter, it was filtered rapidly taking precautions against loss of the solvent. Then 25 ml of the filtrate was evaporated to dryness in a tared flat-bottomed shallow dish, dried at 105°C and weighed [6]. The percentage of water soluble extractive was calculated with reference to the air dried drugs.

Loss on Drying:

About 1.5 gm, of powdered drug was weighed accurately in a porcelein dish which was previously dried at 105°C in hot air oven to constant weight and then weighed. From the difference in weight, the percentage loss of drying with reference to the air dried substance was calculated.

Determination of Foreign Organic Matter:

WHO indicates that restorative plant material ought to be liberated from any perilous or harmful unfamiliar issue and beyond what many would consider possible liberated from harmless unfamiliar issue. Unfamiliar issue was resolved according to Pharmacopoeial necessity (Anonymous, 2001). Leaves powder of *Matricaria chamomilla* Approximately 250g) were independently spreader out in a slim layer

over white piece of paper and examined with the independent eye and isolated the unfamiliar issue by hand as complete as could be expected under the circumstances [7]. The dried powder was gauged and level of unfamiliar natural issue was resolved from the heaviness of the powder taken.

Extraction and fractionation:

The extraction yield of the extracts from plant species is vastly depends on the solvent polarity, which find out both qualitatively and quantitatively the extracted compounds. Ethanol and water are the commonly used solvent for the extraction because of their low toxicity and high extraction yield with the advantage of modulating the polarity of the solvent by using mixtures at different ratios (Jackson et al, 1996). The plant materials (1 kg) were initially defatted with petroleum ether and then extracted with n-hexane (E1), chloroform (E2), ethyl acetate (E3), alcohol (E4) and water (E5) using a Soxhlet apparatus. The yield of the plant extracts ethanol (70%) and aqueous measured about 20 g each after evaporating the solvent using water bath. The standard extracts obtained from *Matricaria chamomilla was* then stored in a refrigerator at 4°C for further use for phytochemical investigation and pharmacological screening [8].

Qualitative examination of phytoconstituents were performed by identification test for Alkaloids, Carbohydrates, Glycosides, Phenolic Compounds, Steroids, Triterpenoids, Flavonoid and Saponins.

Quantitative determination of the chemical constituents for Total phenols Determination, Total alkaloid determination, Total tannin determination and Total flavonoid determination were performed as per standard procedure.

Thin layer chromatography (TLC): The effectiveness of the separation depends on the mixture to be separated, the choice of the mobile phase and the adsorption layer and the term retention factor R_f, is commonly used to describe the chromatographic behavior of sample solutes. The R_f value for each substance is the distance it has moved divided by the distance the solvent front has moved. The solvents, during this research for each crude extract, were chosen by trial and error. The selection was made on the basis of best resolution. The different solvents system has been used of TLC.

Optimization of solvent system:

Ethanol soluble fractions were analyzed by TLC. These fractions constituted of mainly non-volatile mixtures of compounds. The visualizations were aided by either observing the TLC under an UV lamp or by exposing the developed TLC plates to iodine vapour [9]. The TLC was repeatedly improved by changing the solvent systems until a system that gave the best separation was obtained.

Elution procedure

There are three principle elution procedure commonly employed. They are isocratic elution, stepwise elution and gradient elution. Isocratic elution involves the operation of chromatographic column by allowing a solvent mixture of unvarying composition to run through the column until separation is complete. Stepwise elution involves generally if only one solvent is used, elution of only some of the components of the mixture results. Hence to remove the components, which are firmly held, a stronger eluting solvent will be required. Gradient elution technique was first described by Williams and Tiselius which involves the use of a continuously changing eluting medium [10].

Collection of eluting sample

Elute was collected at the rate of 20 drops per minute and each fraction was of about 100 ml. Each fraction was subjected to TLC on silica gel G. The fractions with same R_f were pooled together and concentrated to obtain pure compounds.

Isolation of compounds from ethanol fraction of *Matricaria chamomilla*

The dried chloroform fraction of *Matricaria chamomilla* (20 gm) was mixed with 80 gm silica gel (60-120 mesh) to make the material to get adsorbed in the silica gel. The column was eluted with solvent increasingly initial from 100 % petroleum ether, than increasing order of ethyl acetate in n-hexane (0, to 100% ethyl acetate in petroleum ether) and total 87 fractions were collected. After evaporating the solvents on water bath all the collected fractions were subjected to TLC analysis. On the basis of Rf values, same fractions were pooled together. The pools which gave single spot in iodine exposure were 10-19, 22-33, and 62-71. On the basis of high quantity, 62-71 pool of fractions was taken for purification.

5.14.4 Purification of the isolated compound from *Matricaria chamomilla*

Fractions from column chromatography were subjected to preparative TLC as required to obtain pure compounds. Mixed fractions of 62-71, after evaporating solvent, was subjected for thin layer chromatographic study using various solvent systems. Among them the Hexane: chloroform (1:9) gave good resolution this solvent system was further selected for preparative TLC. The concentrated pool was dissolved in chloroform and the sample was spotted in the preparative TLC plates. The sample applied plates were kept in completely saturated chamber of selected mobile system. After development of chromatogram, the plates were put in iodine vapour and the band (Rf =0.58) was identified and scrapped out from the plates. The scrapped material was then dissolved in pet ether and filtered through whatman filter paper. The filtrate was concentrated and the isolated product was obtained as white crystalline powder (51 mg).

Characterization of isolated compounds by spectral analysis and structural elucidation:

UV spectra of the isolated compounds were recorded in methanol over a scanning range of 200-400 nm and λmax of compounds were determined. Spectra were recorded with a Shimadzu 1700 double beam- UV-VIS spectrophotometer. EIMS (electron impact mass spectrum) in positive mode were recorded on Waters Micromass Q-Tof Micro mass spectrometer instrument at SAIF, Chandigarh. The isolate was mixed with 200 mg KBr (FT-IR grade) and pressed into a pellet. The sample pellet was placed into the sample holder and FT-IR spectra were recorded in the range 375-7500 cm-1 in FT-IR spectroscopy (Model RZX (Perkin Elmer) at SAIF, Chandigarh. ^{1}H and ^{13}C-NMR spectra were recorded on a FT-NMR Cryomagnet Spectrometer 400 MHz (Bruker) using TMS as an internal standard at SAIF, Chandigarh, India. The solvents used were methanol and DMSO. Chemical shifts ware shown in δ values (ppm) with TMS as an internal reference. For column chromatography silica gel 60 (70-230 mesh, Merck, Darmstadt, Germany) was used. Solvents for chromatography were distilled before use. Thin layer chromatography (TLC) was performed using TLC plates (Silica Gel G-60).

Formulation of Herbal Gel (HG):

Gel was prepared by cold mechanical method described by Lalit K et al, 2010. Step 1- Required quantity of polymer (HPMC) was weighed and it was sprinkled slowly on surface of purified water for 2 hrs. After which it was continuously stirred by mechanical stirrer, till the polymer soaked in the water. Step 2- Triethanolamine was added with continuous stirring to neutralize the gel and it maintains the pH of the gel. Then the appropriate quantity of DMSO (Dimethyl sulfoxide) was added to the gel, which behaves as the penetration enhancer, followed by the required quantity of methyl paraben as a preservative. Step 3- Finally the *Matricaria chamomilla* extracts, Menthol, Linseed oil were added to the gel with continuous stirring till all the ingredients get dispersed in gel completely [14, 15]. The quantity of each formulation material is mentioned below

Table 1: Composition of Herbal Gel (HG)

S.N.	Ingredients	P-II		
		HG IV	HG-V	HG-VI
1	Extracts*	1%	2%	3%
2	Menthol	1%	1%	1%
3	Linseed oil	1%	1%	1%
4	HPMC	2%	2%	2%
5	DMSO	2%	2%	2%
6	Triethanolamine	1.5%	1.5%	1.5%
7	Methyl Paraben	0.5%	0.5%	0.5%
8	Methanol-Water mixture	Q.S.	Q.S.	Q.S.

*isolated compounds from ethanolic extract of *Matricaria chamomilla* [P-II]

The above formula is selected on the basis of literature available for the formulation of herbal gelwith these constituents

Evaluation of Formulated Gel by Different Parameters

The herbal gel is formulated with isolated fraction [P-II], menthol, linseed oil and isolated compounds from ethanolic extract of of *Matricaria chamomilla* [P-II] with various excipients. The formulated herbal gel (HG) is evaluated in terms of various physicochemical parameters, pH, Viscosity, extrudabilty and spreadibility.

Measurement of pH

The pH of developed gel formulations was determined using digital pH meter. 1 gm of gel was dissolved in 100 ml distilled water and kept aside for two hours. The measurement of pH of eachformulation was done in triplicate and average values are calculated [16].

Determination of Viscosity

The measurement of viscosity of the prepared gel was done with a Brookfield Viscometer. The viscosity of the gel was obtained by multiplication of the dial reading with factor given in the Brookfield Viscometer catalogues. All the findings were calculated and recorded [17].

Extrudability

The gel formulations were filled in standard capped collapsible aluminum tubes and sealed by crimping to the end. The weights of the tubes were recorded. The tubes were placed between twoglass slides and were clamped. 500 gm was placed over the slides and then the cap was removed. The amount of the extruded gel was collected and weighed. The percent of the extruded gel was calculated (>90% extrudability: excellent, >80% extrudability: good, >70% extrudability: fair) [18].

Spreadability

Spreadability was determined by the apparatus which consists of a wooden block, which was provided by a pulley at one end. By this method spreadability was measured on the basis on slip and drag characteristics of gels. An excess of gel (about 2 gm) under study was placed on this ground slide. The gel was then sandwiched between this slide and another glass slide having the dimension of fixed ground slide and provided with the hook. A one kg weighted was placed on the top of the two slides for 5 min. to expel air and to provide a uniform film of the gel between the slides. Excess of the gel was scrapped off from the edges. The top plate was then subjected topull of 80 gm. With the help of string attached to the hook and the time (in sec.) required by the top slide to cover a distance of 7.5 cm be noted [18]. A shorter interval indicates better spreadability. (Jadhav KR, 2010). Spreadability was calculated using the following formula**:** $S = M \times L / T$

Where, S= Spreadability, M= weight in the pan (tied to upper slide),L= Length moved

by the slide, T= Time (in sec.)

3. RESULT AND DISCUSSION:

Physiochemical analysis of crude drug:

The total ash value was found to be 6.42 % w/w indicating the considerable presence of inorganic radicals. The acid insoluble ash was found to be 1.16 %w/w. The water soluble ash value was found to be 1.6 %w/w. and the moisture content was found 2.01%. Percentage yield of all extract of leaves of *Matricaria chamomilla* were determined. The alcohol soluble and water soluble extractive values were found to be 7.21% w/w and 12.6% w/w respectively. It shows that water soluble extract having higher constituents as comparison to alcohol soluble extract. The moisture content of the drug was determined by the Loss on drying (LOD) method. It was found to be 2.01% w/w.

Table 2: Phytochemical screening of extracts of *Matricaria chamomilla*

Chemical Constituents	Chemical Test	Extracts/Fractions						
		Ethanol extract	Aqueous extracts	n-hexane extracts	Chloroform extracts	Ethyl acetate extracts	Ethanol fraction	Aqueous fraction
Alkaloids	Mayer's	+	-	+	+	+	+	-
	Dragendorff's	+	-	+	-	-	+	-
Saponin	Foam forming test	+	+	-	-	+	-	-
Tannins	Ferric Chloride	+	+	+	-	+	+	-
	Dilute nitric acid	+	+	-	-	+	+	+
Proteins	Million's	-	+	-	+	+	-	+
	Biuret	-	+	-	+	-	-	+
Flavonoids	Shinoda	+	+	+	-	-	+	+

Key (+) = Presence, (-) = Absent

Table 3: Percentage of phytoconstituents present in *Matricaria chamomilla*

Extracts/ Fractions	Constituents presents	Qty. of Phytoconstituents in (%)
Ethanol extract	Alkaloids	11.26
	Phenols	07.19
	Flavonoids	09.03
	Tannin	06.82
Aqueous extracts	Alkaloids	0.00
	Phenols	06.79
	Flavonoids	08.16
	Tannin	04.23
n-hexane extracts	Alkaloids	06.21
	Phenols	5.16
	Flavonoids	06.22
	Tannin	3.21
Chloroform extracts	Alkaloids	09.63
	Phenols	0.00
	Flavonoids	0.00
	Tannin	0.00
Ethyl acetate extracts	Alkaloids	07.63
	Phenols	0.00
	Flavonoids	0.00
	Tannin	05.70

Ethanol fraction	Alkaloids	12.26
	Phenols	7.21
	Flavonoids	6.07
	Tannin	4.11
Aqueous fraction	Alkaloids	0.00
	Phenols	0.00
	Flavonoids	5.36
	Tannin	4.17

Table 4: TLC Studies of ethanolic extract, aqueous extract, n-hexane fraction, chloroform fraction, ethyl acetate fraction, ethanolic fraction, aqueous fraction of *Matricaria chamomilla*

Fraction/ Extract	Solvent system	No of spots	TLC profile	
			R_f value	Color
Ethanol extract	Toluene: methanol: Water (6:2:2)	3	70;0.53;0.68	Dark green, green, pale green
Aqueous extracts	Methanol: toluene: water (5:3:2)	4	0.82;0.71;0.56; 0.63	Dark green, light yellow, green, brown
n-hexane extracts	Hexane: methanol (5:5)	2	0.58;0.45	Light brown , light brown
Chloroform extracts	Hexane: methanol (6:4)	2	0.60;0.50	Light yellow , light brown
Ethyl acetate extracts	Hexane: Ethyl acetate: Methanol (6:2:3)	1	0.76	Very light green
Ethanol fraction	Toluene: ethyl acetate : Methanol : Water(5:5:7:3)	1	0.86	Light brown
Aqueous fraction	methanol: toluene: water (5:3:2)	1	0.69	Dark brown

Isolation of active constituent from the ethanolic extract:

The isolation was started with hexane and polarity increased with ethyl acetate. The elution up to hexane: ethyl acetate (5:5), were mixed together on the basis of their TLC profile to get fraction (P-II). This fraction was concentrated and rechromatographed with hexane DCM mixture with increasing proportion of DCM. The elution up to hexane: DCM (7:3) were mixed together and refrigerated overnight with addition of di-ethyl ether, which yielded compounds (P-II) as a white powder, which was recrystallized as yellow mass with acetone

Characterization of isolated phytoconstituent from ethanol fraction of *Matricaria chamomilla*

using spectroscopic techniques:

The various absorption spectrums of the isolated compound from aqueous fraction of Matricaria Chamomilla showed peaks as follows:

Compound B : Isolated from aqueous fraction

Synonym : 5, 7-Dihydroxy-2-(4-hydroxyphenyl)-4H-1-benzopyran-4-one

Molecular formula : $C_{15}H_{10}O7$

Molecular weight : 270.24 g/mol

Description : Off white to cream white solid

Solubility : Soluble in Petroleum ether and Chloroform Rf value :0.69 (Aqueous)

M. P. : 340–349°C

Phytochemical Test : Shinoda Test (Magnesium Hydrochloride Test) in red, pink, or orange color develops, indicating the presence of quercetin.

Lead Acetate Test in yellow precipitate forms, indicating the presence of quercetin.

6.13.1.1 Spectroscopic Data:
UV (λmax) : 352 nm- B-ring cinnamoyl system, 255 nm -A-ring benzoyl system.
IR (ranges in cm-1) : O–H Stretching at 3406 and 3283 cm^{-1} - hydroxyl groups, C=O Stretching peak near 1655 cm^{-1} - present the carbonyl group of the flavonoid structure, C=C Aromatic Ring Stretching it 1610, 1510, and 1450 cm^{-1} - aromatic ring vibrations, C–O Stretching: Peaks near 1275 and 1200 cm^{-1} suggest the presence of C–O bonds, typical in phenolic compounds.
^{1}H NMR (DMSO) : ^{1}H NMR (400 MHz, MeOD): δ 7.64 (d, J = 4 Hz, 1 H), 7.59–7.44 (m,1 H), 6.78 (d, 1 H), 6.29 (d, 1 H), 6.08 (d, 1 H), 3.21 (dt, 1 H) ^{13}C NMR (DMSO) : ^{13}C NMR (100 MHz, MeOD): δ 175.9, 164.1, 161.1, 156.8, 147.3, 144.8, 135.8, 122.7, 120.2, 114.2, 114.8, 114.5, 103, 1, 97.8, 92.9. EI MS: $C_{15}H_{10}O_7$. [M + H] +: 303.05
Isolated compound is gives positive response to the Shinoda Test and Lead Acetate Test for flavonoids. The melting point of isolated compound was 340-349 °C; the UV λmax value of isolated compound was 352 nm. Mass spectrum of isolated compound showed parent molecular ion [M+] peak at mlz 303.05 which corresponds to the molecular formula $C_{15}H_{10}O_7$. In the IR spectrum of isolated compound a O–H Stretching at 3406 and 3283 cm^{-1} - hydroxyl groups, C=O Stretching peak near 1655 cm^{-1} - present the carbonyl group of the flavonoid structure, C=C Aromatic Ring Stretching it 1610, 1510, and 1450 cm^{-1} - aromatic ring vibrations, C–O Stretching: Peaks near 1275 and 1200 cm^{-1} suggest the presence of C–O bonds, typical in phenolic compounds.
In the ^{1}H-NMR spectrum of isolated compound (400 MHz, MeOD): δ 7.64 (d, J = 4 Hz, 1 H),7.59–7.44 (m, 1 H), 6.78 (d, 1 H), 6.29 (d, 1 H), 6.08 (d, 1 H), 3.21 (dt, 1 H). The ^{13}C NMR of isolated compound (100 MHz, MeOD): δ 175.9, 164.1, 161.1, 156.8, 147.3, 144.8, 135.8, 122.7, 120.2, 114.2, 114.8, 114.5, 103, 1, 97.8, 92.9. IT showed fifteen carbons in the molecule. The DEPT spectrum showed that it contained three hydroxyl groups, one carbonyl group.

EVALUATION OF FORMULATED GEL BY DIFFERENT PARAMETERS:
Physiochemical parameters like appearance, consistency and homogeneity were determined by visual inspection and the findings were calculated and recorded in table. The formulation HG I was smooth in consistency, amorphous and Transparent with light brown color.

Table 5: Physicochemical parameters of formulated herbal gel

Formulation Code	Appearance	Consistency	Homogeneity
HG IV	Light cream green color	Less Smooth	Amorphous
HG V	Light Green color	Very Smooth	Amorphous
HG VI	Off Green color	Smooth	Amorphous

pH Measurment:
The measurement of pH of each prepared formulation was done in triplicate and average values are calculated and recorded.

Plant Name	Formulation Code	pH
(P-2) *Matricaria Chamomilla*	HG-IV	6.12 ± 0.2
	HG-V	5.85 ± 0.2
	HG-VI	6.90 ± 0.2

Viscosity:
The viscosity of the formulated herbal gel was obtained by multiplication of the dial reading with factor given in the Brookfield Viscometer catalogues.

Plant Name	Formulation Code	Viscosity (Cps)
(P-2) *Matricaria Chamomilla*	HG-IV	27205 ±5
	HG-V	28465 ±5
	HG-VI	25600 ±5

Extrudability:
The amount of the extruded etoricoxib herbal gel of was collected and weighed. The percent of the extruded gel was calculated.

Plant Name	Formulation Code	Extrudabilty (%)
(P-2) *Matricaria Chamomilla*	HG-IV	63± 0.5%
	HG-V	69± 0.5%
	HG-VI	66± 0.5%

Spreadability
Spreadability was measured on the basis on slip and drag characteristics of formulated etoricoxibherbal gel.

Plant Name	Formulation Code	(gm/sec)
(P-2) *Matricaria Chamomilla*	HG-IV	17.1 ± 0.2
	HG-V	18.3 ± 0.2
	HG-VI	16.4 ± 0.2

Table 6: % Cumulative drug release of formulation P-2 (HG-IV THG-VI)

Time (in Hrs.)	HG-IV (%)	HG-V (%)	HG-VI (%)
0	0 %	0 %	0%
1	20.32 %	19.2 %	21.01 %
2	29.37 %	28.18 %	30.07 %
3	36.12 %	34.19 %	36.94 %
4	41.5 %	41.23 %	42.05 %
5	48.69 %	46.74 %	47.72 %
6	58.15 %	57.36 %	59.22 %
7	63.16 %	63.35 %	64.23 %
8	71.56 %	70.29 %	72.14 %
9	79.26 %	77.28 %	78.16 %

10	83.22 %	83.08 %	82.19 %
11	89.3 %	88.51 %	89.04 %
12	92.1 %	92.93 %	93.25 %
13	93.23 %	95.56 %	94.8 %
14	94.88 %	96.46 %	95.36 %
15	96.32 %	97.12 %	97.55 %
16	97.02 %	98.36 %	98.77 %

***HG – Herbal Gel**

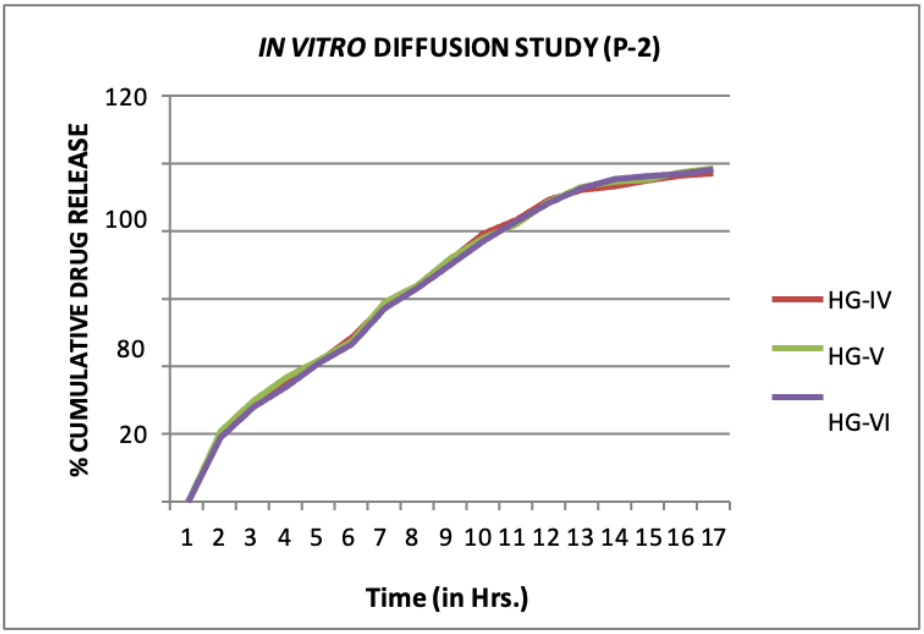

Figure 1: *In-vitro* Drug diffusion study of formulated gel (P-2)

CONCLUSION:

The herbal gel is formulated with isolated fraction [P-II], menthol, linseed oil and isolated compounds from ethanolic extract of of *Matricaria chamomilla* [P-II] with various excipients. The formulated herbal gel (HG) is evaluated in terms of various physicochemical parameters, pH, Viscosity, extrudabilty and spreadibility were found satisfactory, On the basis of various evaluation parameters such as pH, viscosity, spreadability and extrudability and % drug release was found 98.77% for HG-VI, the formulation HG-VI for P-II were selected as best formulation from other formulation.

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