Quality Control Parameters Of Whole Plant Of Portulaca Pilosa: A Research

Amit Kumar[1], Ramesh Pratap Chaudhary[2], Jai Bhargava[3], Akshay Maheshwari[4], Samarjeet Singh[5], Rajesh Kumar Sharma[6], Ravi Kumar Saini[7] Vicky Kumar[8], Abhinit Kumar[9], Manish Pathak[10], Dimple Singh Tomar[11*]

[1,10,11*]Faculty of Pharmacy, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh, India.
[2]Nova College of Pharmacy, Lucknow, Uttar Pradesh, Lucknow, India.
[3,4]J. K. Institute of Pharmacy and Management, Khurja, Uttar Pradesh, India.
[5]R.V. Northland Institute, Dadari Greater Noida, Uttar Pradesh, India.
[6]Teerthanker Mahaveer College of Pharmacy, Teerthanker Mahaveer University, Moradabad, India.
[7,8]School of Pharmaceutical Sciences, Shri Venkateshwara University, Gajraula, Uttar Pradesh, India.
[9]Parmarth College of Pharmacy, Hapur, Uttar Pradesh, India.

***Corresponding Author:** Ms. Dimple Singh Tomar
*Assistant Professor Faculty of Pharmacy Swami Vivekanand Subharti University, Meerut, India
E. Mail id- dimplesinghtomar@gmail.com Contact no.- 9639128183

Abstract:
Portulaca pilosa is a perennial plant & grows on tropical or subtropical lands. *Portulaca pilosa* belongs to Portulacaceae family. *Portulaca pilosa* has various pharmacological actions as they contain biologically active compounds.
Material & Methods: Pharmacognostical and quality control parameter involves study of macroscopic, microscopic, & TLC of *Portulaca pilosa*
Result: All pharmacognostical and quality control parameters of *Portulaca pilosa* were carried out. The morphological evaluations were done to ascertain the standard reference values for standardization of the plant materials where as the microscopy, the section study of the leaves of *Portulaca pilosa* shows the presence of xylem, fibers, trichomes, crystal, phylum, and anisocytic stomata is present.

Keywords: *Portulaca pilosa*, Pharmacognostical parameters, quality control parameters

Introduction:
In herbal medicine, also referred to as botanical medicine or Phytotherapy in Europe, the term "herb" pertains to a plant or plant component employed for medicinal purposes to aid in the healing process during illness and disease[1]. Herbs encompass a variety of plant parts, including leaves, stems, roots, seeds, fruits, flowers, or bark, each utilized for its therapeutic properties[2]. These herbs are utilized in various forms such as fresh, dried, powdered, as ointments, tinctures, or oil extracts, and can also be consumed in liquid form through infusion or decoction[3].
It is estimated that there are around 500,000 plant species currently existing on Earth, with the exact count fluctuating based on whether subspecies are considered. Out of these, approximately 5,000 plants have undergone extensive scientific scrutiny for their medicinal properties[4]. Presently, there are 121 prescription drugs derived from just 90 plant species in use[5]. Notably, 80% of the global population continues to depend on plant-based medicine for healthcare needs[6].
The standardization of herbal medicines involves establishing a set of criteria or inherent attributes, consistent parameters, and precise qualitative and quantitative values that guarantee quality, effectiveness, safety, and consistency[6,7]. It entails the development and consensus on technical specifications. These specifications are determined through experimentation and observation, aiming to define the specific characteristics exhibited by the particular herbal medicine[8,9].The standardization is a tool in the quality control process. According to WHO standardization and quality control of herbal plants is the process involved in the physicochemical evaluation of crude drug covering aspects, such as selection and handling of crude material, safety, efficacy and stability assessment of finished product, documentation of safety and risk based on experience, provision of product information to consumer and product promotion[10,11]. It is normally paid to such quality indices such as- Macro and microscopic examination, foreign organic matter, ash values, moisture content, extractive values, qualitative chemical evaluation, chromatographic examination etc.

Plant profile: *Portulaca pilosa* refers to approximately 100 to 125 different species of annual or perennial plants that grow in tropical and semitropical areas around the world[13]. They vary widely in appearance depending upon the species. Some types of *Portulaca* plants are considered weeds, while others are cultivated as ornamentals or as edible greens[14,15]. Whole plants of *Portulaca pilosa* is shown in figure 1

Fig. 1: Whole plant of *Portulaca pilosa*

MATERIALS AND METHODS:

Collection of plant material: The whole plant of *Portulaca pilosa* was collected from the surrounding of Unnao District, Uttar Pradesh (Voucher number Drug Authentication/SMPU/NADRI/BNG /2011-12/541). The drug sample was indentified and authenticated by Dr. Shiddamallayya N., Senior Scientist, National Ayurveda Dietetics Research Institute Bangalore.

Preparations of plant extracts: The whole plants were washed twice with distilled water to remove the contaminants and air dried. The plants were cut into small pieces and coarsely powered. The coarse powder was passed through sieve No. 10 and extracted with petroleum ether (35-45 $^{\circ}$C) and then extracted with ethanol (95%) by using Soxhlet apparatus for 8 hrs, after that air dried extracts were stored in dessicator till further use.

QUALITY CONTROL PARAMETERS:

Macroscopical Characters: The macroscopic characters examined by using the different physical properties like colour, odor, taste size, texture etc. help to identified the crude drugs[16].

Powder microscopy of leaf: The powder of the plant material was cleared with the chloral hydrate and stained with respective agents such as phloroglucinol and hydrochloric acid (1:1), iodine solution, sudan red III, ruthenium red and the plant sample was mounted free from bubbles on slide to determine the type of cells, and cell contents[17].

Determination of total ash: Weigh 2 grams of the ground, air-dried material and transfer it into a crucible that has been previously ignited and tared. Spread the material evenly within the crucible and gradually heat it to 500-600 ºC until it turns white, signifying the absence of carbon. Allow the crucible to cool in a desiccator for 30 minutes, then promptly weigh it. Calculate the total ash content in milligrams per gram of the air-dried material[18].

Acid insoluble ash: To the crucible containing the total ash, 25 ml of HCl was added and covered with a watch glass and boiled gently for 5 min. Watch glass was rinsed with 5 ml of hot water and liquid was added to the crucible. The insoluble matter was collected on ash less filter paper and washed with hot water until the filtrate was neutral. After that the filter paper containing the insoluble matter was transferred to the original crucible, dried on hot plate and ignited to constant weight. The residue was allowed to cool in a desiccator for 30 min. and weighed without delay. The content of acid insoluble ash was calculated in mg/g of air dried material[18].

Water soluble ash: To the crucible containing total ash, 25 ml of water was added and boiled for 5 min. The insoluble matter was collected in the ashless filter paper and washed with hot water. After that the filter paper containing insoluble matter was transfered to crucible. The crucible was ignited for 15 min. at a temperature not exceeding 450 °C. The weight of residue was subtracted in mg from the weight of total ash and content of water-soluble ash was calculated in mg/g of air-dried material[18].

Determination of water and volatile matter: An excess of water in medicinal plant material encourages the growth of microbes, fungi and insects and deterioration followed by hydrolysis[18].

Loss on drying: Take 4 g powder sample was weight in a previously dried and tared weighing bottle. The sample was dried in an oven at 100-105 °C. The loss of weight was calculated in mg/g of air dried material[18].

Determination of swelling index: The plant material was reduced to fineness passing from sieve No. 22 and was accurately weighed 4 g into a 100 ml glass stoppered measuring cylinder. Water (100 ml) was added and shaken thoroughly after every 10 min. for 1 hr. Then the mixture was allowed to stand for 3 hrs at room temperature. The volume was measured in ml occupied by the plant materials. The mean value of individual readings was determined and calculated related to 4 g of plant material[18].

Foaming index: 1 g of coarsely powdered drug was weighed accurately and transferred to a 500 ml conical flask containing 100 ml of boiling water. It was maintained at moderate temperature for 30 min. The boiling water was cooled and filtered into a 100 ml volumetric flask and added sufficient water. The decoction was poured into 10 stoppered test-tubes in successive portions of 1 ml, 2 ml, 3 ml, etc. up to 10 ml. The tubes were stoppered and shaked in lengthwise motion for 15 sec, two shakes per second. Allowed to stand for 15 min. and the height of foam were measured.
As the height of the foam in every tube is less than 1 cm, the foaming index will be 100. If a height of foam of 1 cm is measured in any test tube, the volume of plant material decoction in that tube (a) will be used to determine the index[18]. Foaming index will be calculated using the following formula Foaming index = 1000/a

Chromatographic analysis: The sample was spotted on the plate and dried for few min. simultaneously solvent system was prepared and allowed to stabilize for 30 min. The plate was developed in the solvent chamber and allowed to run up to three forth of the plate. Then it was removed and air dried. The plate was examined visually and the Rf value was calculated[19].

RESULTS AND DISCUSSION

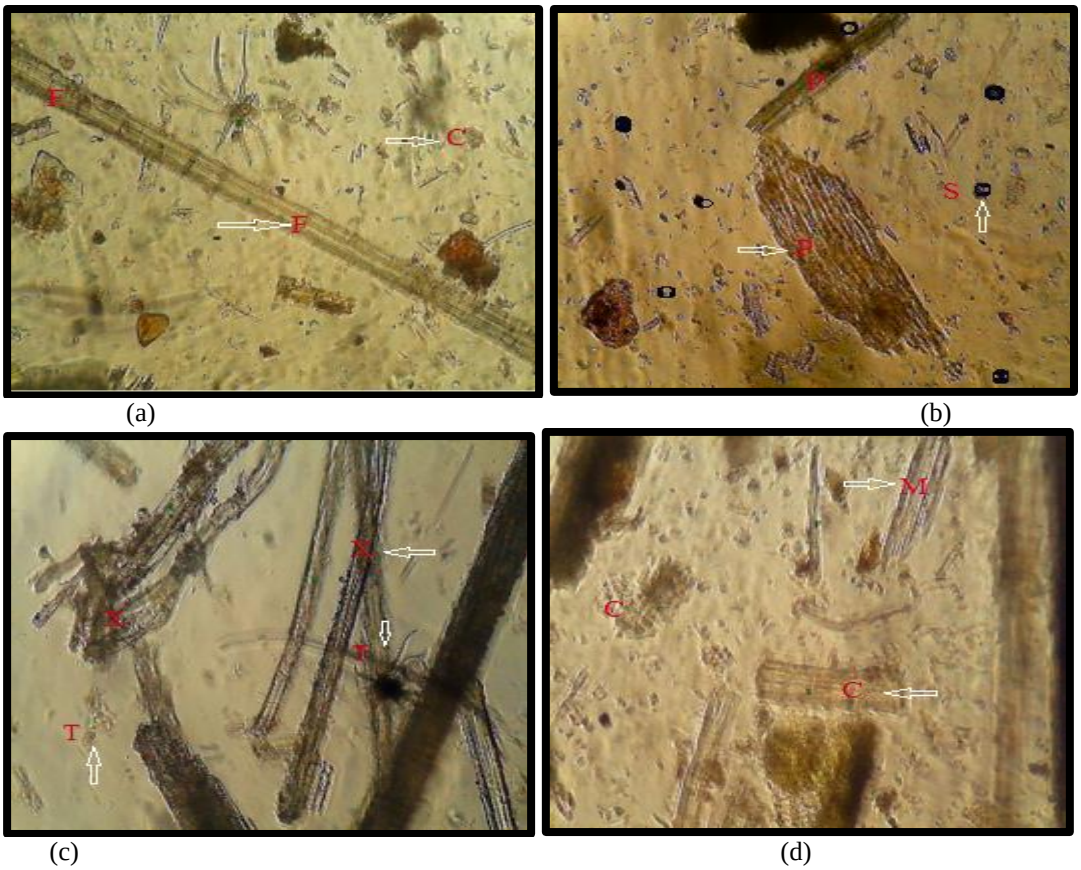
Macroscopical Characters:

Table 1: Macroscopical Characters of Leaves

S. No	Organoleptic characters	*Portulaca pilosa*
1.	Size	20-25 mm
2.	Surface characteristics, texture	Stem are hairy, mostly branching and reddish green colour
3.	Taste	Slightly bitter
4.	Colour	Bright green
5.	Odour	Characteristic

The size, surface characteristics, texture, taste, colour and odour of leaves were examined. It was found that *Portulaca pilosa* has alternate, petiolate to subsessile, succulent, terete to slightly compressed, stem are hairy, with a reddish green colour to 10-15 mm long, acute petioles to 2 mm long. The size of the leaf was 20-25 mm having bright green colour.

Microscopical Characters of Powder:



(a) (b)

(c) (d)

Fig. 2: Powder study of *Portulaca pilosa*

Determination of total Ash value:

Table 2: Observation of Total Ash

Weight of crucible (g) A	Weight of drug (g) B	Weight of crucible + weight of ash (g) C	Ash obtained (g) (C – A)	Total ash (mg / g)
16.450	2	16.625	0.175	175/2 = 87.5

Note: Results were the means of three observations of drug sample.

The total ash of the plant was calculated by subtracting total weight of crucible and weight of ash from weight of empty crucible. The total ash of *Portulaca pilosa* was found to be 87.5 mg/g.

Determination of total acid- insoluble ash value

Table 3: Observation of Acid-Insoluble Ash

Weight of crucible (g)	Weight of drug (g)	Total ash (g)'A'	Weight of crucible + weight of acid insoluble ash (g) 'B'	Acid insoluble ash obtained (g) 'A-B'	Acid insoluble ash (mg / g)
16.816	18.816	17.055	16.980	0.075	37.5

Note: Results were the means of three observations of drug sample.

The acid insoluble ash of the plant was performed and calculated by subtracting total ash from weight of crucible and weight of acid insoluble ash. The acid insoluble ash of *Portulaca pilosa* was found out to be 37.5 mg/g.

Determination of total water soluble ash value

Table 4: Observation of Water Soluble Ash

Weight of crucible (g)	Weight of drug (g)	Total ash (g) 'A'	Weight of crucible + weight of water soluble ash (g) 'B'	Water soluble ash obtained (g) 'A-B'	Water soluble ash (mg / g)
22.673	24.673	22.820	22.790	0.03	15

Note: Results were the means of three observations of drug sample.

The water soluble ash of *Portulaca pilosa* was found to be 15 mg/g.

Determination of water and volatile matter

Table 5: Observation of Water and Volatile Matter

Weight of drug (g)	Weight of Petridish (g)	Total initial weight (g) A	Constant weight after heating (g) B	Difference in weight (g) (A-B)	Loss on drying (mg / g)
4	45.304	49.304	48.800	0.504	504/4= 126

Note: Results were the means of three observations of drug sample.
The water and volatile content in *Portulaca pilosa* was found to be 126 mg/g.

Determination of Swelling Index

Table 6: Observation of Swelling Index

S. No	Time	Readings of *Portulaca pilosa* (ml)			Mean (ml)	Differ. for 4 g plant material D=(b-a) (ml)	Swelling Index for 1g (D/4) (ml)
		R_1	R_2	R_3	M_1		
1	Initially	20	20	20	20 (a)	5.1	1.2
2	After 3hours	25	25.5	25	25.1 (b)		

Note: Results were the means of three observations of drug sample.

The swelling index was performed and calculated to know that how much plant material can swell after putting in water. And also to know that the plant material contains some mucilaginous content. After adding water in the plant material two reading were taken, initial reading and another after 3 hrs. The swelling index of *Portulaca pilosa* was reported to be 1.2 ml.

Determination of foaming index:

Table 7: Observation of height of Drug

Test tube	1	2	3	4	5	6	7	8	9	10
Ratio of water: extract	8:2	7:2	9:3	5:4	6:5	3:6	4:7	2:8	2:9	0:10
Height of foam in *Portulaca pilosa* (cm)	0	0	0	0	0	0.1	0.1	0.2	0.3	0.3

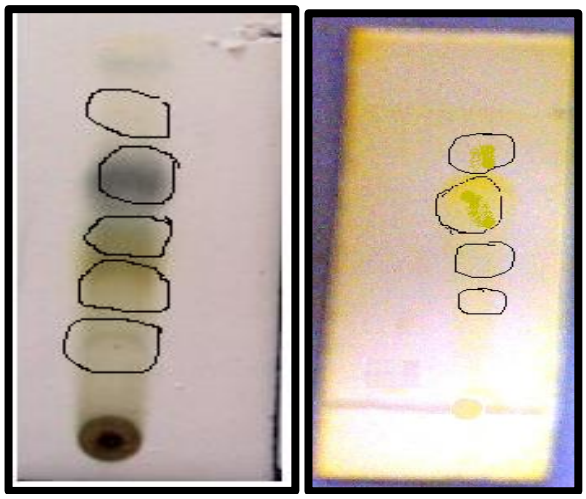
Note: Results were the means of three observations of drug sample

The water and decoction of plant material was put in ten tubes in above given ratio and after shaking the test tubes, foam was measured with the scale. Height of froth measured was less than 1 cm in every test tube. Therefore the foaming index was found to be less than 100.

Chromatographic analysis:

Table 8: Thin layer chromatography analysis

S. No.	Drug sample	Extract	Distance travelled by solvent (cm)	Distance travelled by solute (cm)	Rf value	Colour of spot
1	*Portulaca pilosa*	Petroleum ether	8.5	2.5	0.29	Yellow
				4.5	0.52	Dark yellow
				5.5	0.64	Dark green
				6.5	0.76	Light green
				7.5	0.88	Green
2.	*Portulaca pilosa*	Ethanol	8.5	2	0.25	Yellow
				2.5	0.29	Dark yellow
				4	0.47	Green
				6.5	0.62	Dark green



(a) PEPP **(b)** ETPP

Fig. 3: Developed TLC plate with solvent system

The TLC of Pet. Ether and Ethanol extracts was developed using solvent systems; Toluene:Ethyl acetate : Diethyl amine (70:20:10). Detection of spots was done by Dragendroff's reagent. Five spots were detected in petroleum ether extract of *Portulaca pilosa* Rf ranging from 0.29-0.88, and four spots in the ethanol extract having Rf ranging from 0.25-0.62.

CONCLUSION:

In this present study the pharmacognostic and quality control parameters of *Portulaca pilosa* were investigated. Morphological evaluations were conducted to establish standard reference values for plant material standardization. These evaluations included macroscopic examination of leaves and stems, powder microscopy, determination of total ash (acid insoluble and water soluble), loss on drying, swelling index, foaming index, and chromatographic studies. Powder microscopy revealed the presence of xylem, fibers, trichomes, crystals, phloem, and anisocytic stomata in the leaf sections of *Portulaca pilosa*.

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