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Quantitative phytochemical analysis of *Portulaca oleracea* Linn. growing in unpolluted and polluted area

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Abstract
Portulaca oleracea Linn. of family Portulacaceae is a medicinally important herb. Quantitative phytochemical analysis of *Portulaca oleracea* was carried for four main parameters, i.e., alkaloid, flavonoid, tannin and saponin. In addition to this total protein estimation was also carried. The plant samples were collected from garden area which was unpolluted site, and roadside area facing air pollution generated from traffic exhaust. Plant samples from polluted site also faced nutrient stress, water stress and stress of extreme temperature. Phytochemical analysis was carried separately for leaf and stem samples. Notably the percent values of phytochemicals, namely total alkaloids, flavonoids, tannins, and saponin, and nutrient component protein were found to be relatively high in leaf samples as compared to the stem samples. Their percent values were found to be relatively high in samples collected from polluted site than the samples collected from unpolluted site. It shows that *Portulaca oleracea* has potential to grow in wasteland under nutrient and water stress conditions on one hand and at the same time the phytoconstituents values remain relatively high under stress.

Keywords: *Portulaca oleracea* Linn., phytochemicals, quantitative analysis

Introduction
Portulaca oleracea Linn, a member of family Portulacaceae, is an annual prostrate herb. Stem and leaves are succulent with small bright yellow colour, sessile flowers. It grows commonly in tropical, subtropical and temperate regions as weed along the waste land areas and also on road side. It is widely distributed in different parts of India. Different cultivars are raised as ornament in garden. Tolerant to extreme conditions of stress towards water, temperature, salt and nutrient deficiency, it has been found to be rich in secondary metabolites that are biologically active. These metabolites are various alkaloids, anthraquinone glycoside, cardiac glycoside, coumarins, flavonoids, polysaccharides, fatty acids, terpenoids, sterols, and omega-3- fatty acids. The plant exhibits wide range of pharmacological traits such as antibacterial, antiseptic, antidiabetic, antioxidant, antispasmodic, diuretic, anti-scorbutic, wound-healing properties [1]. Omega-3- fatty acids, has been reported to help in preventing heart attacks and plays a vital role in enhancing the immune system [2]. Since ancient times it has been used as a folk medicine across the world. According to World Health Organization, *Portulaca oleracea* is amongst one of the most exploited medicinal herb across different countries and therefore WHO has named it as 'Global Panacea' [1]. According to Ezekwe *et al*. (1999) [3], it is high in nutrients as well with significantly high amount of vitamins A, C, protein and minerals such as iron, calcium, potassium, magnesium and betacyanins with potent antioxidants property. In Mediterranean and tropical Asian countries it has been used in soups and salads.
In this piece of research work, a quantitative phytochemical analysis of five different compounds, i.e., alkaloids, flavonoid, tannins, saponin and protein, has been has been presented. The samples of *Portulaca oleracea* for the analysis were collected from two different sites- unpolluted site of garden area and polluted site of road side facing traffic exhaust. In addition to this, the plant of polluted site faced nutrient stress, water stress and stress of extreme temperature.

Material and method
Sample Collection: Samples of *Portulaca oreracea* were collected from following two sites:

Unpolluted Site: Plants cultivated in pots as ornaments in the college garden.

Polluted Site: Plants growing as weed, along roadside, facing air pollution from traffic exhaust of Swami Vivekanand Road, Goregaon (west), Mumbai.

Sample preparation: Plants from the respective sites were collected by uprooting. The aboveground vegetative parts - stem and leaves- were washed, and dried at room temperature initially and at 45^0C in hot air oven to remove the traces of moisture. Completely dry samples were crushed and powdered

Quantitative phytochemical analysis

Alkaloid: Method given by Harborne (1973) [4] was followed. Five gm of dry powdered sample was soaked in 200 ml of 10%acetic acid in ethanol and left undisturbed for 4 hours. Solution was filtered and the extract was reduced to one fourth by heating in the water bath. To this concentrate, ammonium hydroxide was added till the complete precipitation. Precipitate was washed with dilute ammonium hydroxide and filtered. Filtrate, the total alkaloid was dried and weight was recorded.

Flavonoid: Procedure given by Bohrn and Kocipal-abyazan (1994) [5] was followed. Ten gm of of dry powdered sample was soaked in 100ml of 80% aqueous methanol for 5 hours to extract flavonoid. The procedure was repeated thrice for complete extraction. Solution was filtered using whatman filter paper No 42 and the filtrate containing flavonoid was dried in water bath and the weight was recorded.

Tannin: Procedure given by Van- burden and Robinson (1981) [6] was followed. Half gm of the plant sample was shaken in 50 ml of distilled water over the shaker. It was filtered using whatman paper, and the filtrate was diluted to a final volume of 50 ml. To 5 ml of this filtrate, 0.1 N HCL and 0.008M potassium ferrocyanide (2ml) was added. Optical density was measured at 605 nm, and total tannins were calculated as per the formula given by Van- burden and Robinson (1981) [6].

Saponin: Method given by Obadoni and Ochuko (2001) [7] was adopted. Twenty ml of the sample was heated for 4 hrs in 20% aqueous ethanol over water bath with stirring at 55°C. Solution was filtered and the residue was again subjected to extraction and filtered. Both the filtrates combined together were reduced to 40 ml over water bath at 90ºC. The concentrate was taken in a separating funnel, to this, 20ml diethyl ether was added. It was shaken vigorously. Upper aqueous layer was separated, lower ether layer was discarded. Saponin content was collected after repeated purification.

Protein: Fresh plant material was used for total protein estimation, using bovine serum solution as standard, as per Lowry *et al.* (1951) [8] procedure. The absorbance was measured at 660 nm and the standard graph was plotted. Protein present in the fresh sample was estimated using the standard graph.

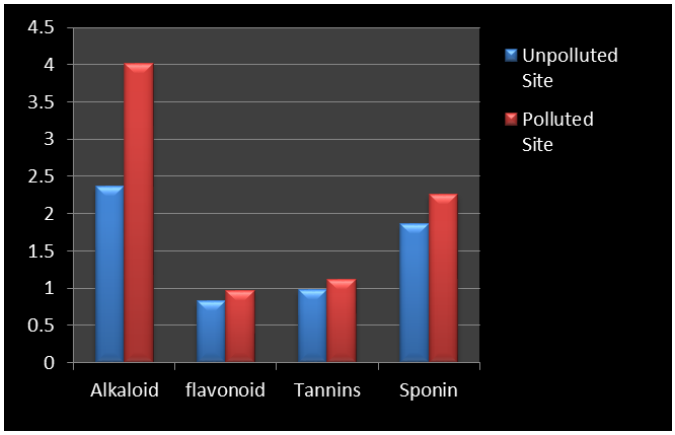
Results

Quantitative phytochemical estimation of *Portulaca oleracea* was conducted for four main parameters, i.e., alkaloids, flavonoid, tannins and saponin. In addition to this total protein estimation was also carried. As stated before the plant samples were collected from garden area and roadside area facing air pollution generated from traffic exhaust. Phytochemical analysis was carried separately for leaf and stem samples (Table1 & Table 2). It was noted that-

1. The percent values of phytochemicals namely total alkaloids, flavonoids, tannins, and saponin were found to be relatively high in leaf samples as compared to the stem samples. Similar pattern was observed for proteins as well. In leaf samples, alkaloids values were reported to be highest (2.37%) followed by saponin (1.86%), tannins (0.96%) and flavonoid (0.83%). This pattern was slightly different in stem where alkaloids were highest (1.72%), followed by tannins (0.68%), saponin (0.58%), and flavonoid (0.54%).
2. Protein content was also found to be high in leaf samples (17.34%) as compared to stem (10.34%). High percent of protein in leaf sample reflects high nutritional value.
3. It was noted that the percent values of all phytochemical - alkaloids, flavonoids, tannins, and saponin- were relatively high in samples collected from polluted site than the one collected from unpolluted site (Histogram1 & Histogram2). Similar trend was recorded for proteins as well. This observation was notably true for leaf as well as stem samples.
4. It therefore appears that *Portulaca oleracea* has potential to grow under nutrient and water stress conditions on one hand and at the same time the phytoconstituents values remain relatively high.

Table 1: Phytoconstituents in the leaf sample of *P. oleracea*

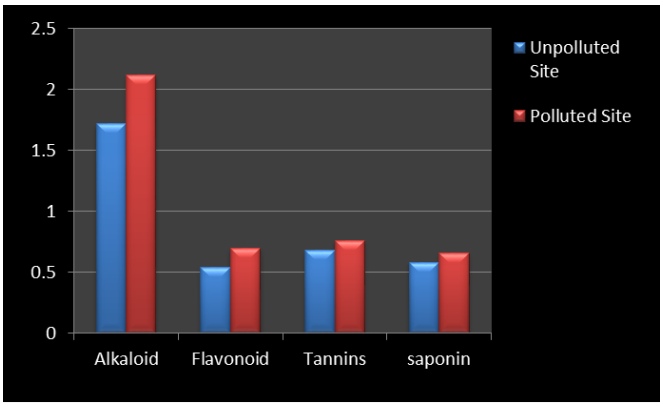
S. N.	Parameter	Unpolluted Site (leaf)	Polluted Site (leaf)
1.	Total Alkaloid	2.37±0.03	4.02 ±0.06
2.	Flavonoid	0.83±0.02	0.97±0.08
3.	Tannins	0.98±0.01	1.12±0.05
a4.	Saponin	1.86±0.07	2.66±0.06
5.	Protein	17.34 ±0.08	19.14 ±0.04



Histogram 1: Comparative values of Phytoconstituents from the leaf samples of *P. oleracea* collected from unpolluted and polluted sites

Table 2: Phytoconstituents in the stem sample of *P.oleracea*

S. N.	Parameter	Unpolluted Site (stem)	Polluted Site (stem)
1.	Total Alkaloid	1.72±0.03	2.12 ±0.03
2.	Flavonoid	0.54±0.01	0.70±0.03
3.	Tannins	0.68±0.06	0.76±0.04
4.	Saponin	0.58±0.06	0.66±0.08
5.	Protein	10.34 ±0.04	13.14 ±0.04



Histogram 2: Comparative values of Phytoconstituents from stem of *P. oleracea* collected from unpolluted and polluted sites

Discussion

The results revealed that the phytochemicals namely, alkaloid, flavonoid, tannin and saponin were present both in leaf as well as stem. However, their concentration in leaf samples was more than stem samples. This clearly indicates that leaves are the primary source of respective metabbolits followed by stem. Similar work was conducted by Ezeabara *et al*. (2014) [9]. As per their findings the phytochemicals and nutrients present in various parts of *Portulaca oleracea* exhibited variation. Alkaloid, flavonoid, tannin and saponin were found to be high in leaf samples as compared to stem and root. Protein was also reported to be high in leaves as compared to stem. In the present studies also similar pattern was observed. Leaves had highest concentration of Crude fibre and fat which were lowest in stem [9]. However carbohydrate level was found to be highest in the stem and lowest in the leaves.

Due to alkaloids only, *Portulaca oleracea* exhibit anti-hyperglycemic and anti-inflammatory properties, alongwith anaesthetic and analgesic properties [10]. Flavonoids show anti-oxidative, antimicrobial, anti-allergic, anti-inflammatory, anti-diarrhoea and anticancer activities [11]. In the present findings, alkaloid, flavonoid, tannin, and saponin values were reported to be relatively high in samples collected from polluted site than the one collected from unpolluted site (Histogram 1, Histogram 2). Similar trend was recorded for proteins as well. It therefore appears that *Portulaca oleracea* has potential to grow in wasteland under nutrient and water stress conditions on one hand and at the same time the phytoconstituents values remain relatively high under stress.

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