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Study on market trends and botanical source of *Sweta Musli* in North India

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Abstract
Sweta Musli, is most popular drug in society as well as scientific communities in present time. It has been proven potent for general debility, vitality and vigour. In recent years increasing demand of *Sweta Musli* in global market has created a huge gap between demand and supply of the drug. Local markets and suppliers have been the basic source for procurement of raw drug which are not trust worthy for genuine drug. The present study aims to workout botanical sources of *Sweta Musli* in crude drug markets and evaluate quality standards of market samples procured from different market of North India. The *Chlorophytum* sp. and *Asparagus* sp. are being frequently sold in crude drug market by the name of *Sweta Musli*. Study reveals that market samples procured from different regional markets of North India were tubers of two different plants *viz. Chlorophytum* sp. and *Asparagus adscendens.*

Keywords: *Sweta musli*, *Chlorophytum* sp., *Asparagus adscendens*, Pharmacognostical study

Introduction
Sweta Musli is a focus and most reputed drug of Ayurveda in present time. It has been prescribed frequently as a general tonic, rejuvenative and aphrodisiac. Therapeutically it has been used as single drug or in compound formulations. Due to its antioxidant, immuno-modulatory, anti-stress, analgesic, anti-diabetic, hypo-lipidemic activity, it becomes a drug of choice in many life style disorders. Gradually increasing demand *of Sweta Musli* in global market has created a huge gap between demand and supply of the drug. Local drug markets are flooded with various drugs by the name of *Sweta Musli*. For monetary gains, brokers and middlemen have also substitute the genuine drug and adulterate it with morphologically similar tubers. In India *Chlorophytum* sp. and *Asparagus adscendens* are accepted as authentic source of *Sweta Musli.*

Aims and Objectives
The study was started from market survey and collection of the drug. Then pharmacognostical studies and comparative analysis of market drug samples were done.

Materials and Methods
Collection of plant material
Market samples of *Sweta Musli* were collected from five different places of North India. Regional markets were selected for the procurement of the drugs for the evaluations of variations in samples. Five major crude drug markets were selected and samples of the crude drug by the name of *Sweta Musli* were procured. Survey work was undertaken during the period October to December 2015. Markets surveyed were – Haridwar, Pilibhit, Lakhimpur, Varanasi and Lucknow and samples were labeled as sample-1, 2, 3, 4 and 5 respectively. Samples were manually cleaned to remove foreign matter and earthen impurities, shade dried and packed in dark coloured polybags. Quality evaluations of these samples were carried out with the help of Pharmacognosy Laboratory, Regional Ayurveda Research Institute for Eye Diseases, CCRAS, Lucknow (U.P.) and National Botanical Research Institute (NBRI), CSIR, Lucknow (U.P.). The standard procedures were strictly followed in the process of quality standardization and parameters of Ayurvedic Pharmacopoeia of India (API) were taken as reference for the quality evaluation of the samples [3-5].

Results [6, 7]
Macroscopic study
The detailed morphological as well as organoleptic studies of sample 1, 2, 3, 4 and 5 were done. (Table-1 and fig.1).

Fig 1: Market sample of Sweta musli

Table 1: Macroscopic Studies

Parameters	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Shape	Tuberous & cylindrical with tapering ends	Tuberous & cylindrical with tapering ends	Cylindrical with slightly tapering ends	Cylindrical with slightly tapering ends	Tuberous & cylindrical with tapering ends
Size	4-10 cm in length and 4-8 mm in diameter	4-12 cm in length and 4-8 mm in diameter	10 – 15 cm long, 4-10 mm diameter	4-10 cm in length and 4-8 mm in diameter	4-10 cm in length and 4-8 mm in diameter
Colour	Dull white	CreamishWhite	Pale yellow	Dull white	Dull white
Fracture	Short, fractured surface more or less uneven	Short, fractured surface more or less uneven	Breaks with uneven fibrous	Uneven fibrous fracture	Uneven fibrous fracture
Surface	Smooth and irregular longitudinal furrows developed when root was peeled and dried	Smooth and irregular longitudinal furrows developed when root was peeled and dried	Smooth and irregular longitudinal furrows developed when root was peeled and dried	Smooth and irregular longitudinal furrows developed when root was peeled and dried	Smooth and irregular longitudinal furrows developed when root was peeled and dried
Odour	Not characteristic	Not characteristic	Pleasant	Pleasant	Not characteristic
Taste	Slightly mucilaginous and sweetish	Slightly mucilaginous and sweetish	Sweetish	Sweetish	Tasteless

Microscopical Study

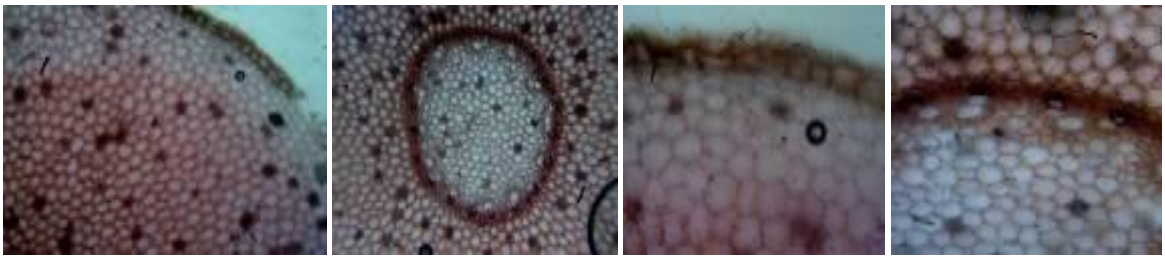

Fig 2: Microscopic view of T.S. of tuber of sample-1

Fig 3: Microscopic view of T.S. of tuber of sample-2

Sample 1&2: The T.S. of preserved peeled sample devoid of epiblema shows layer of cortex consists of many layers of thin walled rounded to polygonal parenchymatous and have little or no intercellular spaces (Probably due to swelling). The inner most layer of cortex is a single layer endodermis pericycle layer followed by a uniseriate of thin walled cells. The vascular tissue is not elaborate. The Xylem is exarch and consists of jointed vessels, 3-5 in number in each group. However, Xylem fibres are quite abundant, surrounding the vessels and jointed to form a more or less continuous irregular ring, xylery fibres are not uniform at all places. The phloem is grouped in between the arches of the xylery tissue along with parenchyma. The central region is occupied by a fairly large pith region, where the cells are closely packed as in cortical region and mostly of polygonal in shape.

Fig 4: Microscopic view of T.S. of tuber of sample-3

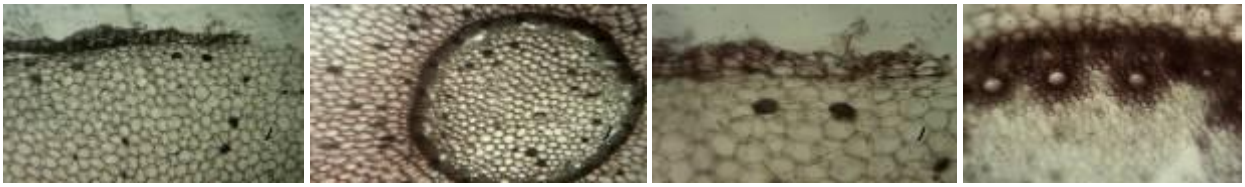

Fig 5: Microscopic view of T.S. of tuber of sample-4

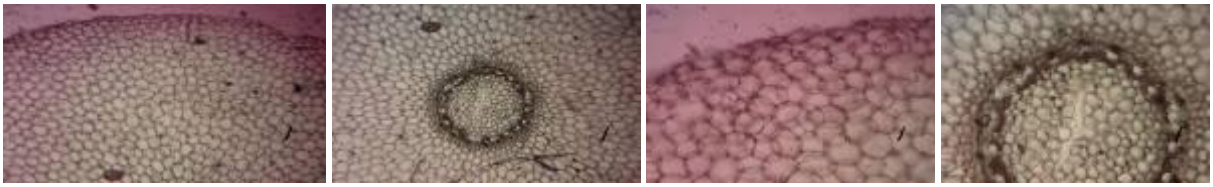

Fig 6: Microscopic view of T.S. of tuber of sample-5

Sample 3, 4 and 5: The T.S. of root clearly showed the outermost layer of epidermal cells, compactly arranged, thick walled cells forming the piliferous layer. Below the epidermis two types of cortex were present i.e. outer lignified cortex and inner parenchymatous cortex. Sclerenchymatous fibres were found scattered in the cortex while some of them on maceration appeared as scattered fibres. A well-developed sheath of stone cells surrounding the endodermis was present at all levels of root. The innermost 1 or 2 layers of cortex immediately outside endodermis comprises of thick walled cells, with numerous circular or oval pits on their walls. The endodermis beneath the sheath shows thickened radial and inner tangential walls. Inner to endodermis, a single layer of thin-walled, parenchymatous cells constituting the pericycle was present in form of a ring, which surrounds the central stele. Phloem and xylem groups, many in number, were arranged on alternate radii and form a ring. In some root samples, especially from plants growing in shaded places, the cortical sclerenchymatous fibres were confined either to the peripheral region only or were absent. Tracheids with usual thin pointed tapering ends and wide pith comprising of completely or partially lignified rounded cells were present.

Microscopic study of powders [8, 9]

The root powder of sample 1 and 2 were buff coloured having mucilaginous and showed large cortical cells, group of fibers and associated with the pitted vessels with reticulate thickening and presence of stone cells with simple pits on their walls (fig.7-8).

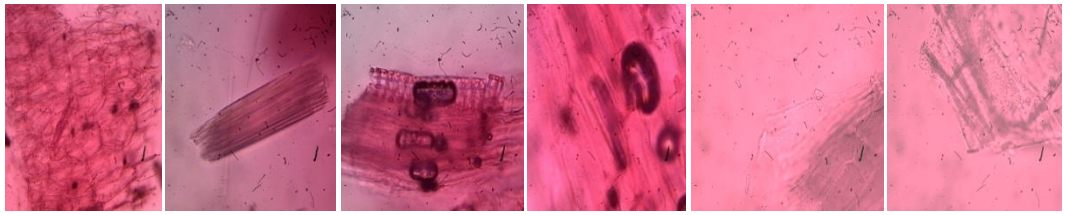

Fig 7: Microscopic view of powder of samples no. 1

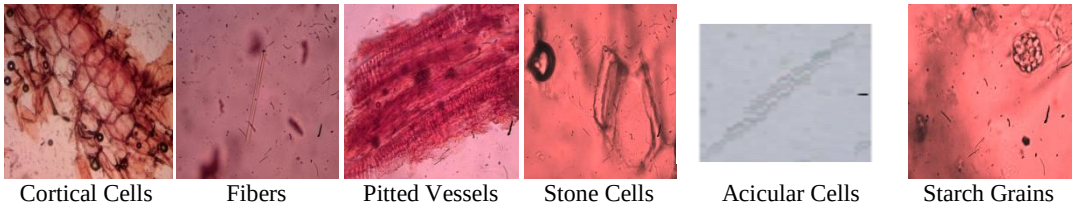

Fig 8: Microscopic view of powder of samples no. 2

The root powder of sample 3, 4 & 5 were pale yellow in colour to yellowish brown and showed mostly cortical parenchyma consisting of thin walled polyhedral cells with or without intra cellular spaces. Large vessels were showing all kinds of thickenings like scalariform, annular and pitted. Fragments of linear pitted tracheids were also found occasionally. Acicular raphide crystals were seen in large number while starch grains were also found throughout the powder (fig.9-11)

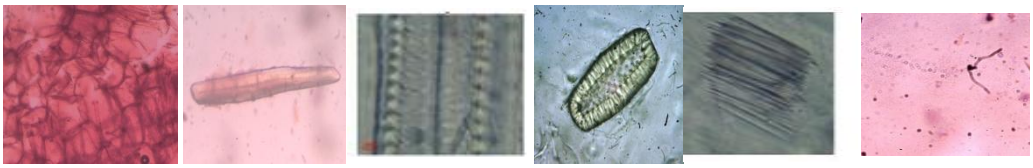

Fig 9: Microscopic view of powder of samples no. 3

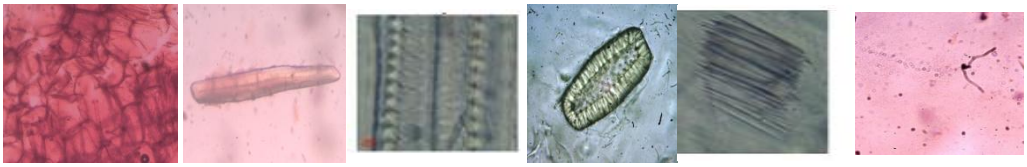

Fig 10: Microscopic view of powder of samples no. 4

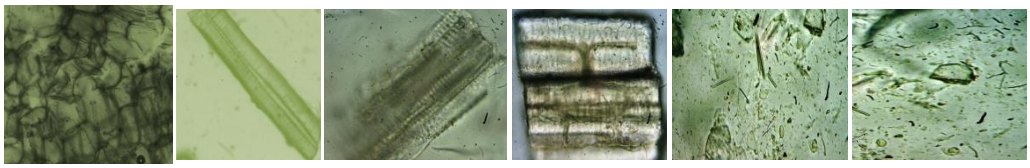

Fig 11: Microscopic view of powder of samples no. 5

Physicochemical Studies [11, 12]

Medicinal plant content should be entirely free from visible signs of contaminations. Abnormal odour, discoloration, slime or signs of deterioration should be detected. Determination of Foreign matter, Moisture content, Total Ash, Acid-insoluble Ash, Sulphated Ash, Alcohol soluble Extractive, Water soluble extractive were done in laboratory by manually (table-2).

Table 2: (Physicochemical Studies)

Parameters	Sample	Sample 2	Sample 3	Sample 4	Sample 5
Foreign matter	0.5%	1%	1%	1.5%	1%
Moisture content	3.67%	3.94%	5.75%	4.45%	4.56%
Total Ash	3.70%	2.86%	2.00%	3.25%	3.43%
Acid-insoluble Ash	1.20%	0.90%	0.25%	0.80%	1.02%
Sulphated Ash	4.35%	3.66%	3.50%	3.96%	3.95%
Alcohol soluble Extractive	5.60%	10.30%	14.56%	5.90%	13.90%
Water soluble extractive	51.40%	39.10%	61.25%	49.80%	37.30%

Phyto-chemical Screening

The alcoholic extracts of all the samples were tested for different phytoconstituents like carbohydrates, proteins, alkaloids, glycosides, saponins, tannins, terpenoids, flavonoids, protein, mucilages and volatile oils (Table 3) [10].

Table 3: Preliminary Phytochemical Analysis

Parameters	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Alkaloids	+	+	_	_	+
Steroids	_	_	+	+	_
Flavonoids	+	+	+	+	+
Glycosides	+	+	+	+	+
Protein	+	+	+	+	+
Reducing Sugar	+	+	+	+	+
Saponins	+	+	+	+	+
Tannin	-	-	-	-	-

Thin Layer Chromatography [6, 7],

TLC of all five market sample were done under UV 254 nm and 366nm by using stationary phase with Aluminium sheet silica gel ^{60} F 254 plates and mobile phase Chloroform – Acetic acid-Methanol-Water (5: 3.5: 1.5: 1). The sample no. 1 showed 8 & 7 spots; sample no. 2, 7 & 8 spots; sample no. 3, 6 & 8 spots; sample no. 4, 4 & 7 spots and sample no. 5 showed 6 & 8 spots under UV 254 nm & 366 nm, respectively.

The sample no.1 and 2 showed 7 spots with same Rf value (0.05, 0.10, 0.15, 0.25, 0.35, 0.55 & 0.80) visualized under UV 254nm and 7 spots with same Rf value (0.10, 0.15, 0.20, 0.30, 0.40, 0.60, & 0.80) visualized under UV 366 nm. The sample no.3, 4, & 5 showed 4 spot with Rf value (0.15, 0.20, 0.45 & 0.75) under UV 254 nm and 7 spots with same Rf value (0.05, 0.10, 0.15, 0.20, 0.25, 0.35, 0.50 & 0.75) visualized under UV 366 nm (Fig-12 and Table-4).

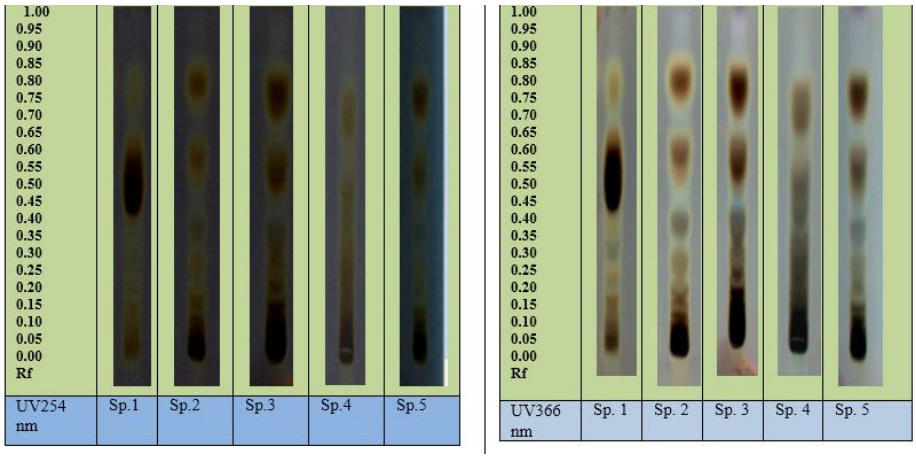

Fig 12: Comparative alcoholic extract Thin Layer Chromatography of all 5 samples under UV254 & UV366 nm

Table 4: Comparative study of TLC findings

Sp. no.	Rf value Spots visualized under UV 254nm	Rf value Spots visualized under UV 366nm
1	0.05, 0.10, 0.15, 0.20, 0.25, 0.35, 0.55& 0.80 (8 spots)	0.10, 0.15, 0.20, 0.30, 0.40, 0.60, & 0.80 (7 spots)
2	0.05, 0.10, 0.15, 0.25, 0.35, 0.55& 0.80 (7 spots)	0.05, 0.10, 0.15, 0.20, 0.30, 0.40, 0.60, & 0.80 (8 spots)
3	0.10, 0.15, 0.20, 0.45, 0.55 & 0.75 (6 spots)	0.05, 0.10, 0.15, 0.20, 0.25, 0.35, 0.50 & 0.75 (8 spots)
4	0.15, 0.20, 0.45 & 0.75 (4 spots)	0.05, 0.10, 0.20, 0.30, 0.35, 0.50 & 0.75 (7 spots)
5	0.05, 0.15, 0.20, 0.35, 0.55 & 0.75 (6 spots)	0.05, 0.10, 0.15, 0.20, 0.25, 0.35, 0.50& 0.75 (8 spots)

Discussion

Transverse Section of peeled root tuber of sample no. 1 and 2 showed some epiblema lignified cell in sample no. 1, no intercellular spaces, two zones of cortical layers in both the samples, a single layer endodermis followed by thin walled cells of pericycle layer, vascular tissues- xylem 3-7 in number in each group more or less continuous irregular ring, the phloem in group in between the arches of the xylery tissue along with parenchyma, central region is occupied by a fairly large pith region and presence of starch grains and crystals. Transverse Section of peeled tuberous root of sample 3, 4 and 5 showed the outermost layer of some thick walled epidermal cells; epidermis followed two types of cortical cells; innermost 1 or 2 layers of cortex immediately outside specialized types of sclerenchymatous fibres were found scattered around thickened radial and inner tangential endodermis of sample no. 3, 4 and 5; a layer of thin-walled, parenchymatous pericycle cells constituting the inner to endodermis which surrounds the central stele; Phloem and xylem groups many arranged on alternate radii; wide pith comprised of completely or partially lignified rounded cells and stone cells, rounded to oval starch grains and acicular raphides crystals were present. The processed sample drugs showed total ash from 2.00 to 3.70%, acid insoluble ash 0.25 to 1.20%, sulphated ash 3.50 to 4.35%, alcohol soluble extractive 5.60 to 14.56% and water soluble extractive from 37.30 to 61.25%. The qualitative chemicals test revealed the presence of alkaloid in sample 1, 2 and 5; steroids in sample 3 and 4; saponins, flavonoids, reducing sugar, protein and glycosides in all the samples. TLC profile produced Rf value of spots in all the sample visualized under UV 254 and 366 nm respectively which serves to compare the drug. After evaluation of these five samples, two samples *viz.* sample 1 and 2 were botanically identified as same species and rest three samples (Sample 3, 4 and 5) were same. All samples of *Sweta musli* are free from adulterants.

Conclusion

Pharmacognostical study of crude drug samples procured from market by the name of *Sweta Musli* revealed that Sample 1 and 2 (macroscopically& microscopically) belonged to *Chlorophytum borivillianum* Saint & Fern; Sample 3, 4 and 5 (macroscopic and microscopic structure) belonged to *Asparagus adscendens* Buch. Ham. ex Roxb. Present study reported that current availability of botanical source of *Sewta Musli* in Haridwar, Pilibhit, Lakhimpur, Varanasi and Lucknow crude drug market. *Chlorophytum borivillianum* and *Asparagus adscendens* both are marketed and used as single as well as in many formulations in North India. These parameters could be further useful for authentication of others crude drug markets across the country.

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