International Journal of Herbal Medicine
Available online at www.florajournal.com

IJHM International Journal of Herbal Medicine

E-ISSN: 2321-2187
P-ISSN: 2394-0514
IJHM 2015; 3(5): 36-42
Received: 13-10-2015
Accepted: 16-11-2015

Lal Chand
Maharaja Gangasingh University, P. G. Department of Botany, Dungar College, Bikaner 334001, India.

Moolchand Mali
Maharaja Gangasingh University, P. G. Department of Botany, Dungar College, Bikaner 334001, India.

Correspondence
Lal Chand
Maharaja Gangasingh University, P. G. Department of Botany, Dungar College, Bikaner 334001, India.

Comparative study of phytochemical parameters of hydrophytes reported from Sri Ganganagar district of Rajasthan

Lal Chand, Moolchand Mali

Abstract
A large number of hydrophytes are an important feed resource for live stock. The leaves and shoot of the plants are rich in protein, carbohydrate and minerals, which supports the animal for the maintenance of their health. An account of hydrophytes plant of India was published still large area remains unexplored. However, some important hydrophytes such as *Eichhornia crassipes, Hydrilla verticillata, Trapa natans* var *bispinosa, Ipomoea aquatica* and *Typha angustata* found in Sri Ganganagar, District of Rajasthan have not been subjected to their proper study and therefore the present study has been undertaken for the first time to fill up this gap. The estimation of total ash, crude protein, crude fiber, nitrogen free extract, calcium, phosphorous etc. from the collected plant material, is easy to conduct of comparative study on Hydrophytes.

Keywords: *Eichhornia crassipes, Hydrilla verticillata, Trapa natans var. bispinosa, Ipomoea aquatica and Typha angustata,* Phytochemical, hydrophytes.

1. Introduction
Earth's water resources, including rivers, lakes, oceans, and underground aquifers, are under stress in many regions. Humans need water for drinking, sanitation, agriculture, and industry. A water molecule can travel to many parts of the globe as it cycles. (UNICEF, 2013) [1] Indian states are full of canals used for irrigation and as water transport in different parts of the country. These water transports of India play a very important role in irrigation of crops in drought region of India such as Rajasthan. The canal is one of the projects of Green revolution in India and also runs through the Great Thar Desert. Some of the important canals of the state are as follows.

1.1 Gang Canal: The canal is "a blood transfusion from the living Punjab into the moribund Marusthal." This canal takes off from the Satluj River near Husaini wala (Firozpur) and has a total length of 1,280 km. It is also called Bikaner canal and irrigate 3.4 lakh hectares of land in Sri Ganganagar district.

1.2 Indira Gandhi Canal: It is an ambitious canal project to divert the additional waters of the Ravi, Beas and Satluj rivers to the dry areas of Rajasthan. The main canal has a total length of 649 km of which 179 km lies in Punjab and Haryana. Along with distributaries its total length would be 8,000 km irrigating about 14.62 lakh hectares of land in Ganganagar, Bikaner, Jodhpur and Jaisalmer districts.
Sri Ganganagar district is connected by three main canal systems, GANG CANAL, INDRA GANDHI CANAL, and BHAKRA CANAL. Most of the land is irrigated by these canal systems; rest of the lands is irrigated by the ground water. Moreover, In these canals aquatic plants play an important role in sequestering large quantities of nutrients (Cronk J. K. and Fennessy M. S., 2001) [2] and metals (Mays P. A. and Edwards G. S., 2001) [3] from the environment by storing them in the roots and/or shoots. Hydrophytes reflect the nutrient status of their immediate habitat by their presence or absence and abundance and thus can be effectively used as biological indicators (kshirsagar and Gunale, 2013) [4] Therefore, it is important to determine the phytochemical value i.e., estimation of carbohydrate, protein, fat, crude fiber, crude protein, ash, nitrogen free extract, minerals, content like calcium, phosphorus etc. of some valuable hydrophytes: *Eichhornia crassipes; Hydrilla verticillata; Trapa natans* var *bispinosa; Typha angustata* and *Ipomoea aquatica,* found in Sri Ganganagar District of Rajasthan, India.

2. Materials and methods

The plant material (samples) for the present investigation were collected from different study sites Sri Ganganagar, Rajasthan, India. Fresh plant specimens were collected between 7.00 a.m. to 10 a.m. and kept in polythene bag and brought to the laboratory. The specimens were washed in running tap water to remove the adhered dirt and rinsed with distilled water.
Collected plant material was withdrawn as root, leaves for the analysis. All the plant part were dried at 35 °C for 72 hours and the dried plant part were separately powdered and stored in small polythene bags for the estimation of Phytochemical characters.

2.1 Ash percentage: For the estimation of Ash, 5 gm dried plant parts were taken in weight crucible and it was placed in muffle furnance for ashing at 600 °C. Percentage of ash was calculate by following formula:

$$\frac{W_1 - W_2}{W} X\ 100$$

Percentage of Ash =

W1 = Weight of crucible (gm)
W2 = Weight of crucible +Ash (gm)
W3 = Weight of dried sample (gm)
This Ash was used in analysis of Mineral content.

2.2 Crude Protein: The percentage of nitrogen was calculated by the formula

$$\frac{\text{Ml of N/7 } H_2SO_4 \text{ X } 0.02X100X10}{\text{Gm. of sample taken}}$$

Percentage of nitrogen =

The percentage of crude protein was calculated by multiplying the percentage of Nitrogen by 6.25.Percentage of CP = Percentage of Nitrogen X 6.25

2.3 Ether Extract: For the estimation of fat or ether extract soxhalt's apparatus was used. Percentage of fat or ether extract was obtained by following formula

$$\frac{W_2 - W_1}{W} X\ 100$$

Percentage of EE =

Where;
W1 = Weight of oil flask and petroleum ether (gm)
W2 = Weight of the oil flask after ether extract (gm)
W3 = Weight of sample (gm)
Content of the thimble was dried and further used for the analysis of crude fiber.

2.4 Crude Fiber: The loss in weight during ashing was the weight of crude fiber and percentage of fiber was calculated as follows:

$$\frac{W_2 - W_1}{W} X\ 100$$

Percentage of CF=

Where;
W1 = Weight of crucible before Ashing (gm)
W2 = Weight of crucible after Ashing (gm)
W3 = Weight of dried sample (gm)

2.5 Nitrogen Free Extract

This conventional weend's method was followed for the calculation of nitrogen free extract. It was calculated by following formula:
Percentage of Nitrogen free =
100 - (%CP+%EE+%CF+%Ash) extract.

2.6 Dry Organic Matters: The percentage of dry matter was calculated by

$$\frac{W_3 - W_1}{W_2 - W_1} X\ 100$$

Following formula:
W1 = Weight of empty petridish (gm)
W2 = Weight of sample and petridish before drying (gm)
W3 = Weight of sample and petridish after drying (gm)

2.7 Total Carbohydrate

Phenol sulphuric acid method described by Dubois *et al.* (1956) [5] was followed for the estimation of total carbohydrates.

2.8 Calcium: For the estimation of calcium, method given by Telpatra *et al.*, (1940) [6] was followed.

2.9 Phosphorus: From the stock solution of acid solution ash 25 ml aliquot was taken in 250 ml beaker in which 10 ml of concentrated nitric acid and 10 ml of freshly prepared saturated ammonium molybdate solution was added for precipitation. Yellow coloured precipitation of phosphor-ammonium molybdate to appear. The beaker was kept overnight allowing the precipitate of settle down. Next day supernatant was filtered through whatman filter paper number 42 the precipitate was washed with 2 percent nitric acid and then several time 3 percent potassium nitrate solutions for the remove of acid. The precipitate was dissolved in 20 ml of N/7 standard nitric acid solution. Phenolphthalein was used as indicator. Phosphorus contents were calculated as follow

$$\frac{\text{ml of NaOH used X10 X0.001925}}{\text{gm of sample taken for ashing}} X\ 100$$

Percentage of phosphorus =
Where, 10 is the dilution factor.

3. Results of Analysis

The leaves and shoot of the plants are rich in protein, carbohydrate and minerals, which supports the animal for the maintenance of their health. The comparative value of phytochemical parameters of some important hydrophytes exhibited in table (1).

Table 1: Comparative account of Phytochemistry of some Important Hydrophytes

Sr.No	Plant Constituents	*Eichhornia crassipes*		*Ipomoea aquatica*		*Hydrilla verticillata*		*Typha angustata*		*Trapa natans var. bispinosa*	
		shoot	leaves	shoot	leaves	shoot	leaves	shoot	leaves	shoot	leaves
1	Total ash	10.26	14.35	8.26	10.39	11.31	16.38	12.08	16.01	7.3	9.82
2	Crude Protein	20.36	22.65	10.02	10.25	22.13	24.08	8.3	6.32	11.21	22.32
3	Crude fiber	18.26	17.52	9.23	7.26	20.09	18.62	4.5	3.86	8.34	6.38
4	Ether extract	8.65	8.7	4.26	3.2	10.72	9.34	4.21	2.38	4.08	3.82
5	Nitrogen free extract	41.42	37.42	65.23	67.42	35.23	30.82	70.08	71.34	68.84	57.53
6	Organic matter	87.7	85.95	88.24	87.92	88.05	82.25	86.94	83.02	92.24	89.98
7	Total carbohydrate	0.35	0.42	0.32	0.38	0.34	0.37	0.41	0.49	0.33	0.34
8	Calcium	2.06	2.04	0.26	1.03	1.04	0.68	0.36	0.22	0.21	0.16
9	Phosphorous	0.26	0.28	0.24	0.22	0.82	0.42	0.56	0.31	0.18	0.29

3.1 Eichhornia crassipes

The average chemical composition of shoot of *Eichhornia crassipes* percentage dry basis was found to be total ash 10.26, crude protein 20.36, crude fiber 18.26, ether extract 8.65, nitrogen free extract 41.42, organic matter 87.7, total carbohydrate 0.35, calcium 2.06, and phosphorus 0.26.

The average percentage of chemical composition of leaf was found to be total ash 14.35, crude protein 22.65, crude fiber 17.52, ether extract 8.7, nitrogen free extract 37.42, organic matter 85.95, total carbohydrate 0.42, calcium 2.04, and phosphorus 0.28.

3.2 Ipomoea aquatica

The average chemical composition of shoot of *Ipomoea aquatica* percentage dry basis was found to be total ash 8.26, crude protein 10.02, crude fiber 9.23, ether extract 4.26, nitrogen free extract 65.23, organic matter 88.24, total carbohydrate 0.32, calcium 0.26, and phosphorus 0.24.

The average percentage of chemical composition of leaf was found to be total ash 10.39, crude protein 10.25, crude fiber 7.26, ether extract 3.2, nitrogen free extract 67.42, organic matter 87.92, total carbohydrate 0.38, calcium1.03, and phosphorus 0.22.

3.3 Hydrilla verticillata

The average chemical composition of shoot of *Hydrilla verticillata* percentage dry basis was found to be total ash 11.31, crude protein 22.13, crude fiber 20.09, ether extract 10.72, nitrogen free extract 35.23, organic matter 88.05, total carbohydrate 0.34, calcium 1.04, and phosphorus 0.82.

The average percentage of chemical composition of leaf was found to be total ash 16.38, crude protein 24.08, crude fiber18.62, ether extract 9.34, nitrogen free extract 30.82, organic matter 82.25, total carbohydrate 0.37, calcium 0.68, and phosphorus 0.42.

3.4 Typha angustata

The average chemical composition of shoot of *Typha angustata* percentage dry basis was found to be total ash 12.08, crude protein 8.3, crude fiber 4.5, ether extract 4.21, nitrogen free extract 70.08, organic matter 86.94, total carbohydrate 0.41, calcium 0.36, and phosphorus 0.56.

The average percentage of chemical composition of leaf was found to be total ash 16.01, crude protein 6.32, crude fiber 3.86, ether extract 2.38, nitrogen free extract 71.34, organic matter 83.02, total carbohydrate 0.49, calcium 0.22, and phosphorus 0.31.

3.5 Trapa natans var bispinosa

The average chemical composition of shoot of *Trapa natans* var *bispinosa* percentage dry basis was found to be total ash 7.3, crude protein 11.21, crude fiber 8.34, ether extract 4.08, nitrogen free extract 68.84, organic matter 92.24, total carbohydrate 0.33, calcium 0.21, and phosphorus 0.18.

The average percentage of chemical composition of leaf was found to be total ash 9.82, crude protein 22.32, crude fiber 6.38, ether extract 3.82, nitrogen free extract 57.53, organic matter 89.98, total carbohydrate 0.34, calcium 0.16, and phosphorus 0.29.

4. Discussion and Conclusion

The estimation of total ash, crude protein, crude fiber, nitrogen free extract, calcium, phosphorous etc. from the collected plant material, is easy to conduct of comparative study on *Eichhornia crassipes*, *Hydrilla verticillata*, *Trapa natans* var. *bispinosa*, *Ipomoea aquatica* and *Typha angustata.*

According to this data, total ash on percentage dry base *(table 1; Fig. 1)* of leaf of *Hydrilla verticillata* is highest value16.38 and lowest value in leaf of *Trapa natans* var. *bispinosa* is 9.82, whereas shoot of *Typha angustata* on percentage dry basis was found highest value 12.08 and lowest value 7.3 for percentage dry base of shoot also found in *Trapa natans var. bispinosa.*

For total crude protein on percentage dry base *(table 1; Fig. 2)* of leaf of *Hydrilla verticillata* is highest value 24.08and lowest value in leaf of *Typha angustata* is 6.32, whereas crude protein of shoot of *Hydrilla verticillata* on percentage dry basis was found highest value 22.13 and lowest value 8.3 for percentage dry base of shoot also found in *Typha angustata.*

Comparative account for total Crude fiber on percentage dry base *(table 1; Fig. 3)* of leaf of *Hydrilla verticillata* is highest value 18.62 and lowest value in leaf of *Typha angustata* is 3.86, whereas Crude fiber of shoot of *Hydrilla verticillata* on percentage dry basis was found highest value 20.09 and lowest value 4.5 for percentage dry base of shoot also found in *Typha angustata.*

According to data *(table 1; Fig. 4)*, total ether extract on percentage dry base of leaf of *Hydrilla verticillata* is highest value 9.34 and lowest value in leaf of *Typha angustata* is 2.38, whereas shoot of *Hydrilla verticillata* on percentage dry basis was found highest value 10.72 and lowest value 4.08 for percentage dry base of shoot found in *Trapa natans* var. *bispinosa.*

For nitrogen free extract on percentage dry base *(table 1; Fig. 5)* of leaf of *Typha angustata* is highest value 71.34, and lowest value in leaf of *Hydrilla verticillata* is 30.82, whereas nitrogen free extract of shoot of *Typha angustata* on percentage dry basis was found highest value 70.08 and lowest value 35.23 for percentage dry base of shoot also found in *Hydrilla verticillata.*

Comparative account for organic matter on percentage dry base *(table 1; Fig. 6)* of leaf of *Trapa natans* var. *bispinosa* is

found highest value 89.98 and lowest value in leaf of *Hydrilla verticillata* is 82.25, whereas organic matter of shoot of *Trapa natans* var. *bispinosa* on percentage dry basis was found highest value 92.24 and lowest value 82.25 for organic matter percentage dry base of shoot also found in *Hydrilla verticillata.*

According to data *(table 1; Fig. 7)*, total carbohydrate (mg/g) on percentage dry base of leaf of *Typha angustata* is highest value 0.49 and lowest value in leaf of *Trapa natans* var. *bispinosa* 0.34, whereas shoot of *Typha angustata* on percentage dry basis was found highest value 0.41 and lowest value 0.32 for percentage dry base of shoot found in *Ipomoea aquatica.*

For calcium on percentage dry base *(table 1; Fig. 8)* of leaf of *Eichhornia crassipes* is highest value 2.04, and lowest value in leaf of *Trapa natans* var. *bispinosa* is 0.16, whereas calcium of shoot of *Eichhornia crassipes* on percentage dry basis was found highest value 2.06 and lowest value 0.21 for percentage dry base of shoot also found in *Trapa natans var. bispinos.*

Comparative account for phosphorus on percentage dry base *(table 1; Fig. 9)* of leaf of *Hydrilla verticillata* is found highest value 0.42 and lowest value in leaf of *Ipomoea aquatica* is 0.22, whereas phosphorus of shoot of *Hydrilla verticillata* on percentage dry basis was found highest value 0.82 and lowest value 0.18 for phosphorus percentage dry base of shoot found in *Trapa natans var. bispinosa.*

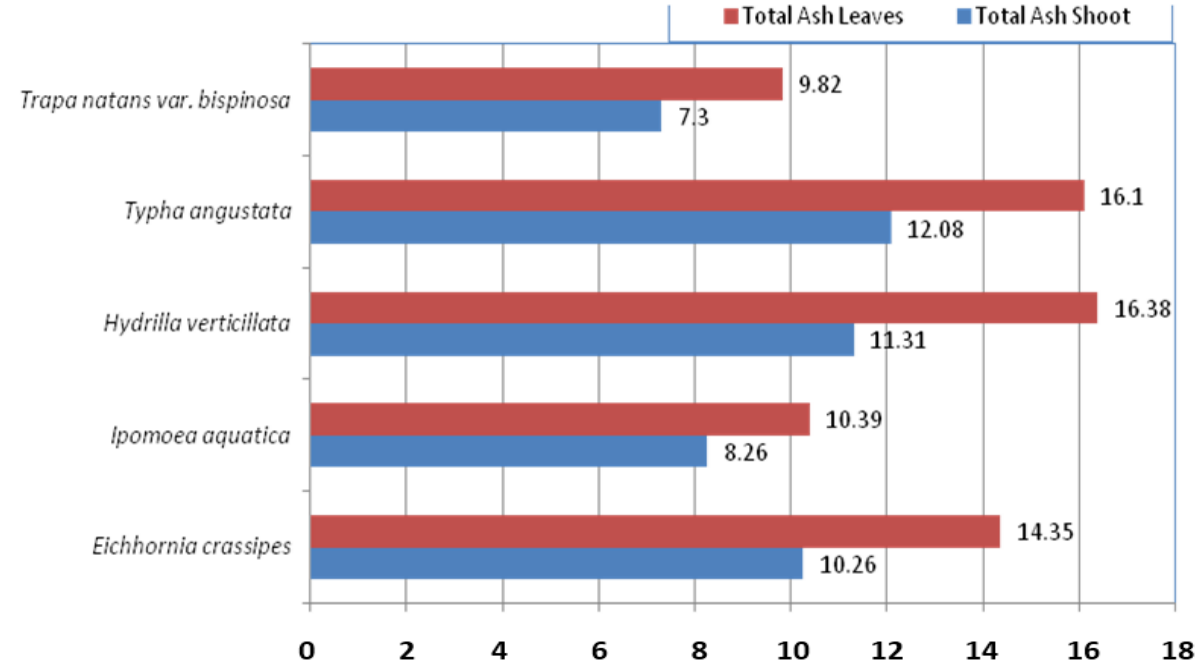

Fig 1: Total Ash (% dry matter)

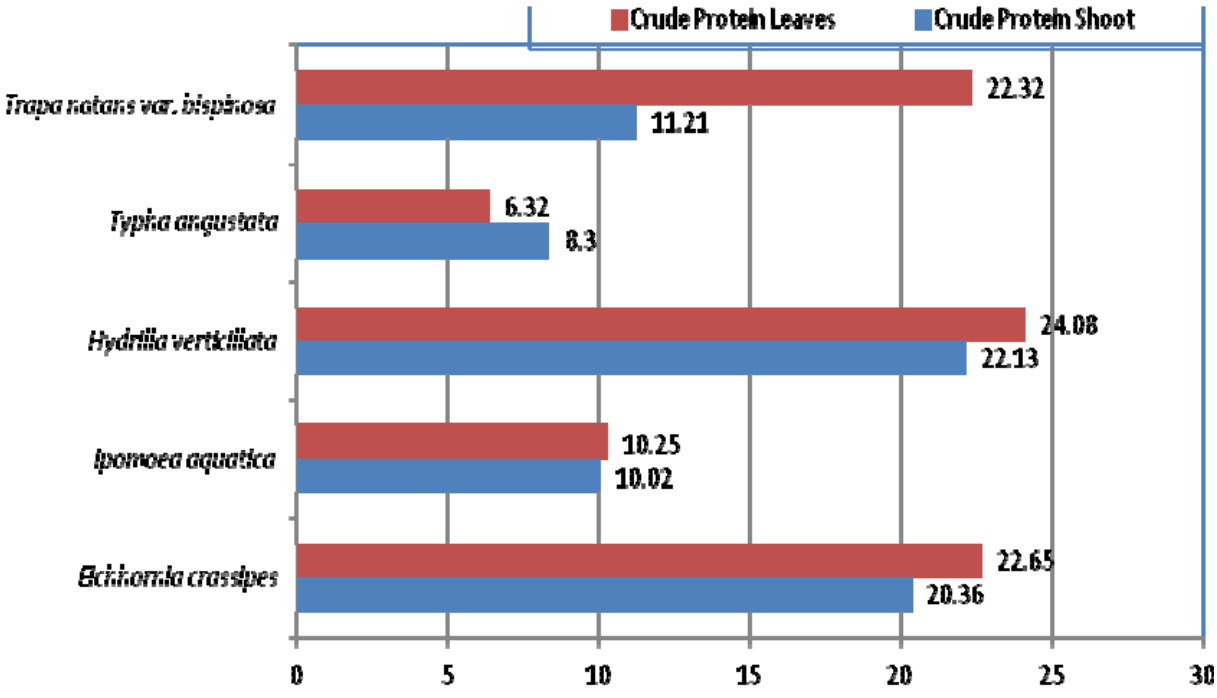

Fig. 2: Crude Protein(% dry matter)

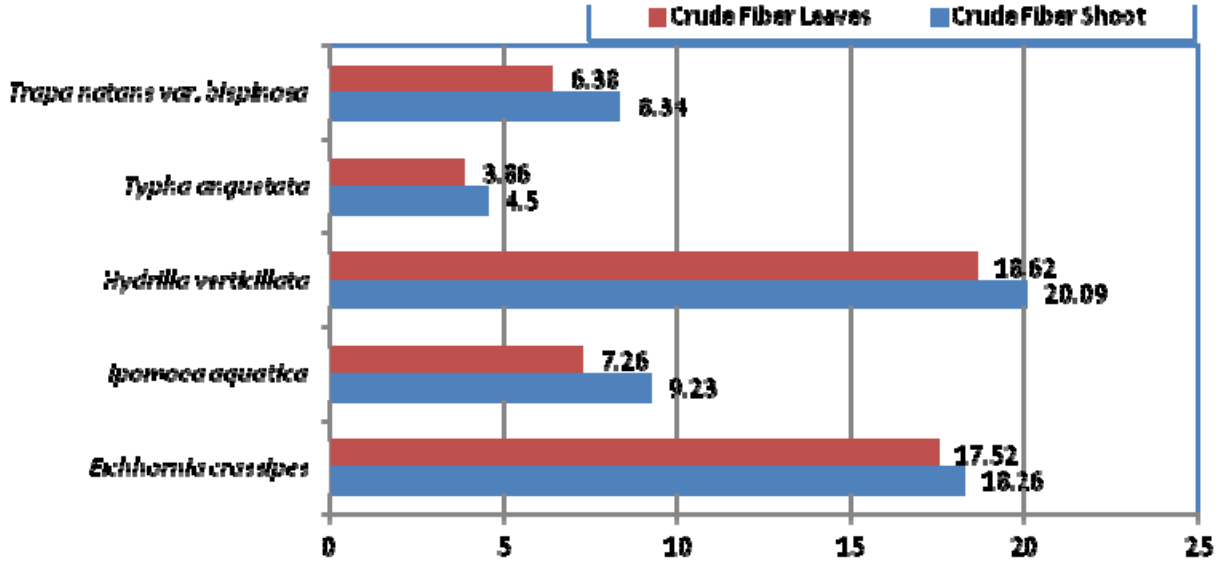

Fig. 3: Crude Fiber (% dry matter)

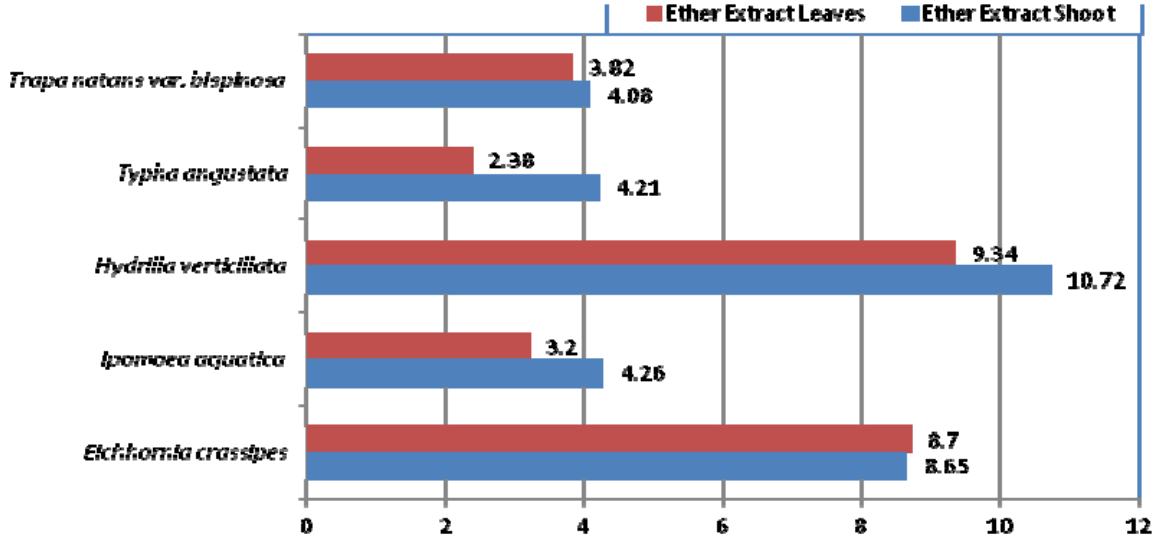

Fig.4: Ether extract(% dry matter)

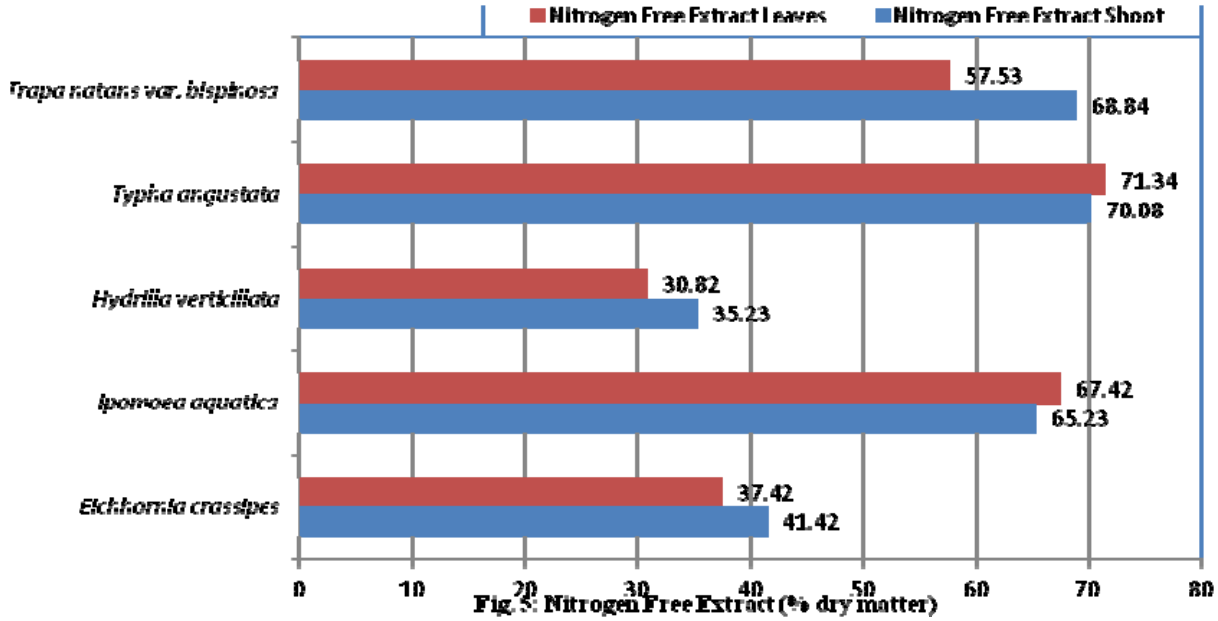

Fig. 5: Nitrogen Free Extract (% dry matter)

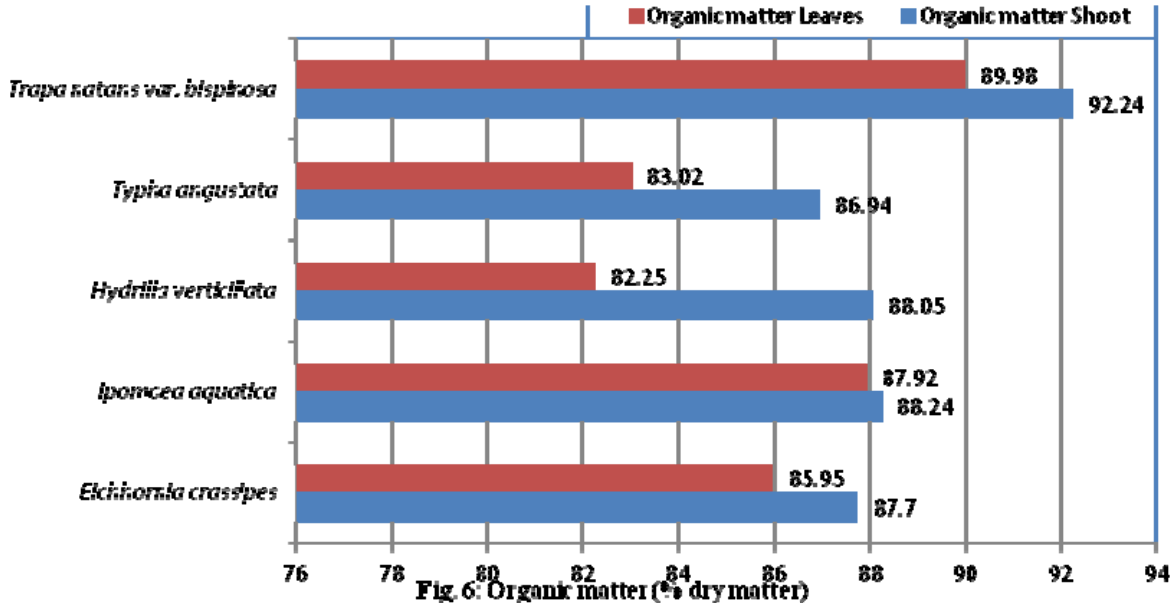

Fig. 6: Organic matter (% dry matter)

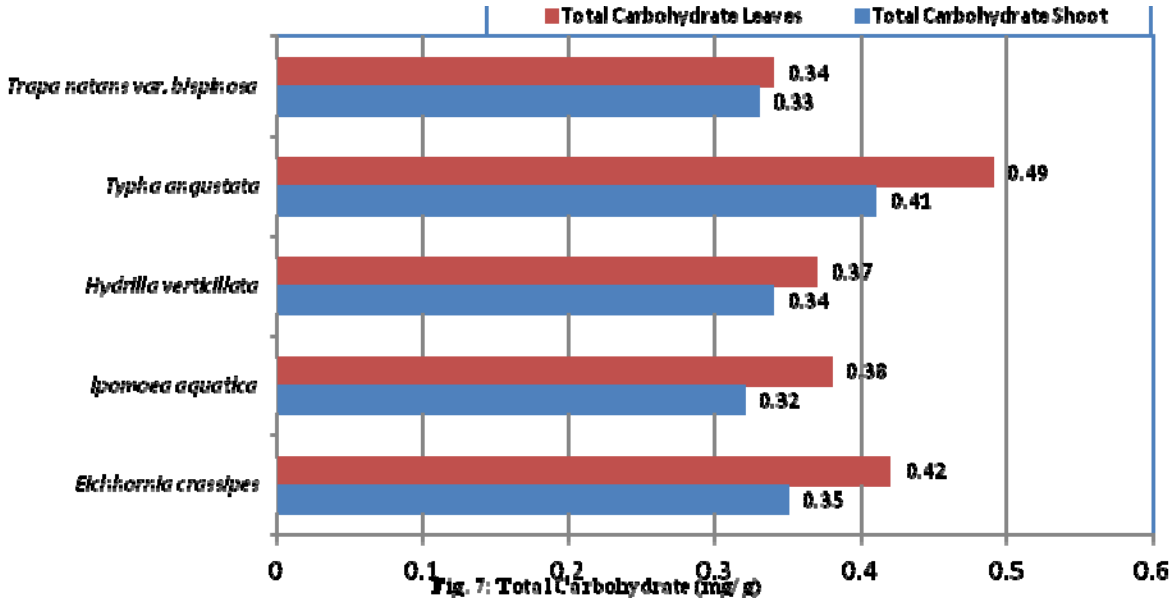

Fig. 7: Total Carbohydrate (mg/ g)

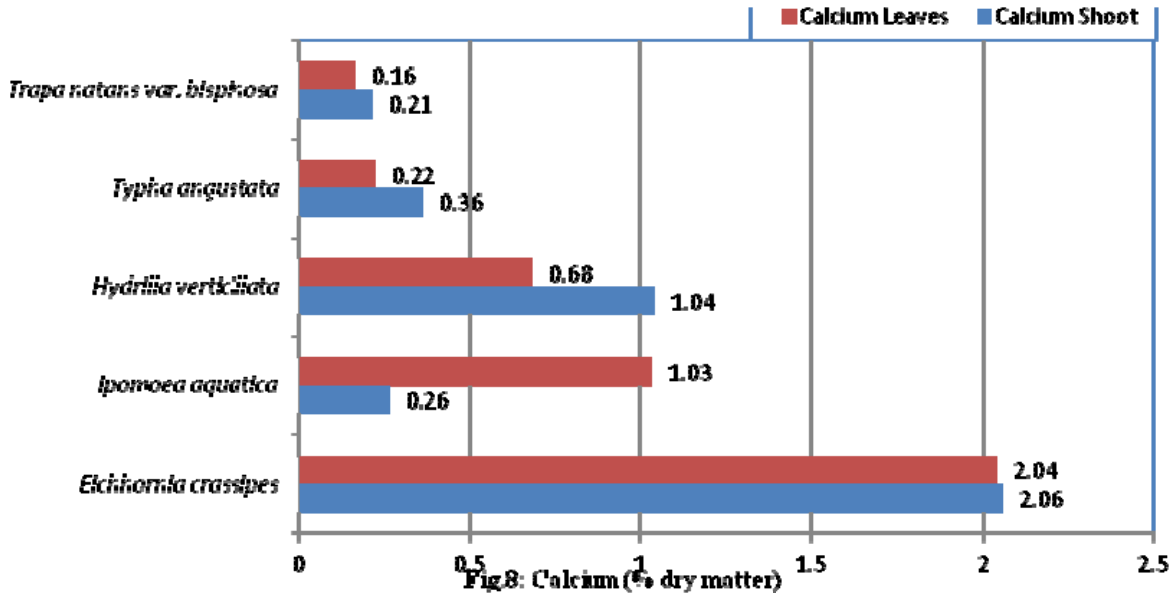

Fig.8: Calcium (% dry matter)

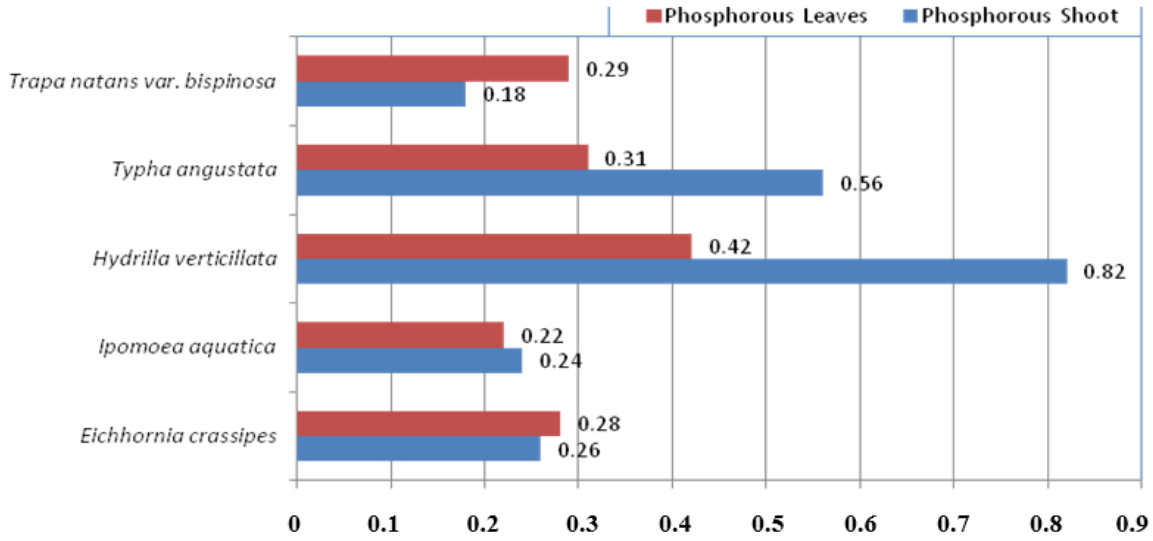

Fig 9: Phosphorous (% dry matter)

The high percentage total organic matter, crude protein and amino acids have all composition helped to explain why the plant is used as a valuable source of animal feed. Studies have shown that these nutrients in hydrophytes are a vital source of food for both ruminants and non ruminants. Hydrophytes are ideal for composting and can also be used as green manure. Traditionally the plants have been used in India for several important medicinal purposes.

References

1. UNICEF: University of Florida, Institute of Food and Agricultural Sciences Gainesville, FL 32653, 2013.
2. Cronk JK, Fennessy MS. Wetlands Plants. Biology and Ecology, Lewis, Boca Raton, Fla, USA, 2001.
3. Mays PA, Edwards GS. Comparison of heavy metal accumulation in a natural wetland and constructed wetlands receiving acid mine drainage. Ecol. Eng 2001; 16:487-500.
4. Kshirsagar D, Gunale Venkat R. Diversity of aquatic macrophytes from river mula Pune City, MS, India, science Research reporter, 2013; 3(1):09-14.
5. Dubois M, Gilles K, Hamilton Rebers J, Smith F. Colorimetric methods for determination of sugars and related substances. Analytical chemistry, 1956; 28(3):350-356.
6. Telpatra SK, Ray SL, Sen KC. Estimation of phosphorus, calcium, sodium. Potassium in food stuffs. Indian J Vet Sci. 1940, 10-243.