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RESEARCH ARTICLE

Effect of *Azolla* as organic compost on dry matter yield and chlorophyll content of Sarpagandha plants

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SUMMARY

Sarpagandha *(Rauvolfia serpentina)* is a well known medicinal plant of family Apcyanaceae. Present study deals effect of *Azolla* as organic compost on growth and composition of sarpagandha (*Rauvolfia serpentina* L.). Sarpagandha plants were grown on soil pot culture conditions and treated with different doses of *Azolla*. After 100 days of cultivation sarpagandha plants were studied for dry matter yield, chlorophyll contents. Thus, *Azolla* can be better organic compost for the growth and composition of sarpagandha.

Key Words **:** Organic compost, *Azolla*, Sarpagandha, *Rauvolfia serpentina* L.

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Farming is man's oldest occupation. Since the very early times of human civilization, man started cultivating profitable crops for his living. He arranged plough and oxen for ploughing, constructed wells and ponds for irrigation, learnt how to store the agricultural products properly and safely, found ways of controlling the insects that were harmful for the agricultural products, he used manures to increase the agricultural yield, tamed animals such as cows, buffaloes and goats in order to get continuous supply of manures, and also got ghee, milk etc. from them. Moreover, man worshipped the Earth assuming her as 'Mother Earth'. He learned all these activities through the experiences of a large number of generations, and all the information passed from one generation to other.

Agricultural methods prevailing throughout the world are based on biological processes. Farmers in agriculture based country like India are using biological manures in farming since thousands of years. There has been a strong relation between Indians and farming and cattle rearing. On the one hand, animals such as cows and others provide milk along with good organic manure; on the other hand, oxen were used for ploughing the fields, transporting heavy materials etc. It has been very rare in human history that a farmer has faced a lack of food material for his own living. Contrary to this, a farmer was always capable of providing fruits, flowers, milk, ghee, and cereals for many others. There have been no evidences of malnutrition, starvation, unemployment and poverty before the establishment of the British rule in India. It was during the British rule that the Indian farming started facing diminution, Indian farming along with Indian industries diminished consecutively, and the conditions became so worse that the Indian farmers became incapable of producing sufficient food according to the need of the country.

During the sixties after independence in India, new changes took place in the conditions and direction of Indian agriculture with the beginning of the Green revolution. Use of developed breed of seeds, chemical fertilizers and insecticides was promoted in order to increase the production of food materials which resulted as per the expectations, and India became self-dependent in the field of food production. Once dependent on foreign assistance for the likes of PL480, India started exporting food materials to a number of countries of

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the world. India's export of wheat to more than 40 countries worldwide in 2003 is a milestone in the accomplishments of the green revolution in India.

However, the continuous and uncontrolled use of chemical fertilizers in the name of green revolution has now faded the brightness of the accomplishments of the last five decades of green revolution. Our agricultural production has come to a halt after achieving a particular point. Due to the increasing population, area of the agricultural land is decreasing day by day, while the use of chemical fertilizers and insecticides in farming is increasing everyday. Agricultural scientists think that the Indian farming has reached its high end with the use of chemical fertilizers. The uncontrolled use of chemicals have brought a number of major problems such as hardness of soil, decreased water holding capacity of soil, increase in the demand of water for production of crops, contamination of soil and water, decrease in the number of animals and micro-organisms that are beneficial for farming, poisoning of agricultural products, modification in physical and chemical properties of soil, ill-effects on the health of man as well as animals and birds, environmental pollution, pollution of underground and surface water etc.

Today, Indian farming is facing many problems such as increase in the cost of production, decrease in production etc. and farmers are not getting enough value for their agricultural yields. The *Annadaata* itself is incapable of meeting his own needs for food. During the last two decades, incidents of suicides by a large number of farmers due to starvation and import of wheat in Vidarbha in Maharashtra, Bundelkhand in Uttar Pradesh, Orissa, South Karnataka, Andhra Pradesh, West Bengal etc. have raised big questions over the success of Green revolution. Although use of developed seeds, chemical fertilizers and insecticides was the need of the hour during the sixties, today's vital farming needs are-increase in production, decrease in cost, to use the techniques that are friendlier to the animals, birds and human beings as well as environment friendly. Therefore, throughout the world it is felt that the agricultural techniques should be modified and environment friendly biological techniques must be promoted rather than using chemical fertilizers uncontrollably.

Since ancient times in India, animal secretions, dung, animal urine etc. has been used as organic manure. Even today small and poor farmers and those having less knowledge of modern agricultural techniques use only cow-dung as organic manure. Because of its specific water holding capacity, use of cow dung as organic manure increases the quantity of moisture in soil. Due to this, on one hand the water holding capacity and quantity of nutrients in soil increases, on the other hand, the demand of water for irrigation also decreases. Cow dung when used in farming as organic manure, doesn't produce ill-effects on animals such as frogs and earthworms, which are beneficial for agriculture. This helps in lessening the cost of production as well as being environment friendly.

Azolla is a well-acquainted aquatic *Pteridophyte* fern, which is found in non-flowing fresh water. It is found naturally in warm and normal temperate regions worldwide. It is the only 'living' member of Azollaceae family. It is found on the surface of water in the form of mat like layer. Its occurrence controls the reproduction of mosquitoes and hence, it is also known as mosquito fern. *Azolla* has a specific place among organic manures due to its nitrogen holding capacity. In its antrum is found nitrogen holding symbiotic blue green algae *Anabaena azollae*, which holds the atmospheric nitrogen. This is found in the places having temperatures up to 40^0C throughout the world. 4.5-10 pH is favourable for its growth. It grows double in quantity in 2-5 days. It is the only symbiotism which can be used directly in farming.

Sarpagandha is an important medicinal plant of Apocyanaceae family which is used in all the medicinal therapies worldwide since very long times. It is evergreen shrub, which grows straight. Its stem is generally branchless, covered with yellow-brown bark. The roots are tuberous, soft, glandular and non-uniform in shape, which are sour in taste. The leaves are winded anticlockwise, longitudinal with a long tip. The flower is white or violet in color, the fruit is single or paired, white or black-berry like in colour. The flowers reproduce from April to July, and the fruits, from July to September. The tuberous roots of Sarpagandha provide more than 30 alkaloids. Out of these, reserpine, serpentine, reserpeninun, rauvolfinine, deserpidine, recinamine are of great importance. Sarpagandha is used as a medicine for controlling high blood pressure and provide calmness worldwide.

Sarpagandha is also used in Ayurveda, Siddha and Yunani sciences of medicines for the treatment of high blood pressure, insomnia, cardiac diseases, a number of mental problems such as psychic disorders, mental retardation, epilepsy, agitation and various neurotic disorders. In south eastern Bihar and the tribal areas of Jharkhand, the powder of Sarpagandha roots is used for the treatment of snakebites or snake poisoning. The extracts of its roots is used for the treatment of dysentery, diarrhea and other intestinal disorders. The decoction of roots is used for the treatment of labor related problems and the juice of leaves is used for the treatment of opacity of cornea. Presently, the commercial demand of Sarpagandha is highest among all the herbs. The present study is based on the effect of *Azolla* as organic compost on Sarpagandha and the possibilities of organic farming.

MATERIALS AND METHODS

Sarpagandha (*Rauvolfia serpentina* L.) plants were raised in soil-pot culture condition. All selected plants were equal in shape and size. *Azolla* was collected from ponds and ditches of in and around Kanpur. Soil mixed with *Azolla* as organic compost as nil (0), 50, 100, 150, 200 and 250g *Azolla*/

kg soil. There were three replicates for each treatment. Calculated amount of distilled water was applied each day to the pots to provide equal moisture conditions in each pot as far as possible. Stems, leaves and roots of 100 days old sarpagandha plants were taken from estimation of dry matter yield and Chlorophyll content. Dry matter yield was determined by drying stems, leaves and root samples of sarpagandha in a forced drought oven at 70°C for 24 Hours to constant weight. chlorophyll contents were determined by method of Petering *et al.* (1940) as well as Agnihotri (2008).

RESULTS AND DISCUSSION

Effect of *Azolla* as organic compost on dry matter yield of stems, leaves and roots of 100 days old sarpagandha plants and chlorophyll contents of 100 days on leaves of 100 days old sarpagandha plants is arranged in Table 1. 250 g *Azolla*/kg level showed maximum increase in dry matter yield of stems, leaves and roots of 100 days old sarpagandha plants. Similarly, 250 g *Azolla*/kg level showed maximum increase in chlorophyll contents of leaves of 100 days old sarpagandha plants. Most of the levels of *Azolla* supply showed significant (P=0.05) or highly significant (P=0.01) increase in dry matter yield and chlorophyll contents of 100 days old sarpagandha plants. As compared to control, 250 g *Azolla*/kg soil treatment showed 29.29 per cent increase in roots, 50.17 per cent increase in stems and 39.06 per cent increase in leaves of 100 days old sarpagandha plants. Similarly, as compared to control, 250g *Azolla*/kg soil treatment showed 64 per centincrease in the chlorophyll contents of leaves of 100 days old sarpagandha plants.

Application of *Azolla* as organic compost showed remarkable growth in dry matter yield of various plants. A large number of researchers found valuable results while using *Azolla* as organic compost on various crops such as rice, wheat, corn, banana, tomato, potato, okra and taro etc. Moore (1969), Patel *et al.* (1980), Peters (1984), Pillai (1982), Kanniyan (1987), Van Hove (1989), Kohli and Mitra (1990), Datta (2000) and Mohan *et al.* (2004) observed that application of *Azolla* increased dry matter yield of rice crop in various climatic conditions. Ram and Prasad (1982), Van Hove (1989), Marwaha *et al.* (1992) observed encouraging results using *Azolla* as organic compost on wheat. Pereira and Shetty (1987) reported that *Azolla* has the potential for raising the production of coffee. Xiang and Li (1981) found *Azolla* very effective for raising the production of corn crop. Van Hove (1989) observed that *Azolla* is very effective green manure for banana, wheat, tomato and taro crops. Application of *Azolla* also increased the chlorophyll contents of plants. Kalita and Sharma (1994) and Saxena (2001) reported beneficial results while using *Azolla* on the chlorophyll contents of rice plants. Same results were observed by Agnihotri *et al.* (2007) on safed musli plants and Mohan and Bahal (2007) on okra plants.

Conclusion :

The demand for organic cultivation of plants of medicinal utility is increasing rapidly around the globe. *Azolla* has a great potential as organic compost in this field. Replacing chemical fertilizers with *Azolla* as organic compost in agricultural activities can play a significant role in maintaining the status of environment. Increasing proper and organized utilization of *Azolla* is another possibility to protect and conserve ponds and small water bodies. Application of *Azolla* as organic compost can lead to a great boon in reawakening of Indian agriculture.

Table 1 : Effect of *Azolla* as organic compost on dry matter yield and chlorophyll content of 100 days old Sarpagandha (*Rauvolfia serpentina* L.) plants

Plant part	g *Azolla* / kg soil						LSD	
	Control	50	100	150	200	250	P=0.05	P=0.01
				g dry matter yield / plant				
Roots	11.47	12.59	13.05	13.25	14.67	14.83	0.17	0.24
Stem	11.24	12.82	14.33	15.50	16.80	16.88	0.50	0.70
Leaves	9.24	11.32	11.49	12.70	12.73	12.85	0.07	0.11
				mg chlorophyll / 100 g fresh matter				
Leaves	25	29	33	36	40	41	2	3

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