TO STUDY THE EFFECT OF SOYAWASTE-SOIL BLENDS ON THE GROWTH OF GLYCINE MAX.

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A B S T R A C T

The physico-chemical characterization of soyawaste (Waste from soyabean oil industry) was carried out for temperature, pH, TDS, EC, Ca, Mg, Na K etc. Simillarly, physiochemical analysis of three different types of soil S1, S2, S3 and irrigation water were carried out. The growth of soyabean plants was studied in 0%, 2%, 5%, 10%, 15%, 20%, soyawaste with three different soil blends. Growth of soyabean plants was monitored regularly after every month up to three months (Nov'10-FEB.'11) from the date of sowing during Winter season of the year 2010-11. In the present work, the different plant parameters like height, leaves, flowers, fruits and dry weights of each plant in various blends in three types of soils were recorded. The study showed that the effluent had both stimulatory as well as inhibitory effect depending upon blending concentration. In this investigation it is found that, at 5%-10% soyawaste-soil blending concentration there was a promotional influence on the plant growth which might be due to the optimum level plant nutrients in the effluent at these blends. Thus, from the commercial view point, overall plant growth and maximum number of fruits were found at 5%-10% blending. The present work showed the possibility of use of industrial wastes like soyawaste by blending with soil for better soyabean plant growth and yield.

Keywords: Soil analysis, Soyawaste effluent, Glycine max, Waste characterization

1. Introduction

Industrialization plays a very vital role in the developing countries. But, the problem of disposal of industrial waste is of great concern due to limited space available than the big volumes of industrial effluents. Industrial effluent contains very poisonous salts, alkalis, acids, gases, heavy metals, insecticides etc. In India most of the industries used to discharge the untreated wastes either on the land or into the watercourses. Due to this practice, waste waters pollute the water resources and ultimately the agriculture land (Arjun et al.,2013) These untreated industrial effluents mainly contain most of the organic and inorganic compounds and are discharged into nearby water bodies. As a result these water bodies become toxic. High level of pollutants due to industrial waste discharged into canals, streams or rivers causes increase in COD, BOD, TDS, TSS etc. makes the water unsuitable for drinking, irrigation and for other uses (Malik et al.,2003). It was observed that the growth, yield and soil health get reduced when the farmers used these industrial effluents directly for irrigation of the cultivated land (Nandy,1994). Effluents affect the time of flowering, number and weight of fruits and vascular bundles (Uaboi-Egbenni et al, 2009). Heavy metals present in the effluents accumulate in the plants can cause physiological and biochemical changes (Singh et al, 1981) (Fisher et al 1981).
In many countries, suffering from low availability of water, waste water is normally used for irrigation purposes (Al-Ansari et.al., 2013)., (Arora et al., 2008). Thus, effluent irrigation has been practiced for centuries throughout the world (Shuval et al. 1986), (Tripathi et al., 2011). This provides farmers with a nutrient enriched water supply and society with a reliable and inexpensive system for wastewater treatment and disposal (Feigin et al., 1991). In India also being a cheap source of irrigation farmers are applying wastewater to

their fields. This is being done without knowing the effects of contaminants present in the effluents on the growth and quality of different plants. This problem can be solved by using these effluents/wastes in controlled amount for the growth of agricultural crops. Present work is designed to study the effect of various concentration of soyawaste effluent and soil blends on the soyabean (glycine max) plant.

2. Experimental

The present study was conducted with five different blending concentrations of effluent i.e soyawaste collected from Rasoya Protein Pvt. Limited industry, Wani Dist. Yavatmal (India) with different soils. The physico-chemical properties of the effluent were analysed by the procedure of (APHA, 2005). Similarly the soil samples and irrigation water were collected by standard sampling methods (Chopra, S. L. and J. S. Kanwar, 2005)and were analysed for their physico-chemical characteristicsbystandard methods (Jackson, 1973). The different soils were dried and powdered. Different blends of soyawaste and 2 kg soil of each type were prepared with blending concentrations like 0% (control), 2%, 5%, 10%, 15% and 20% by weight method. These blends were kept in cleaned polythene bags. Thus six systems for each soil and their replicates i.e total 36 bags were prepared. The soyabean seeds of make Eagle were procured from market. Two seeds of soyabean were sown in each bag. All the systems were watered equally with same period and with the same irrigation water. The height, number of leaves, flowers and fruits of each plant were recorded when the plants were fully matured (Dec10-Feb 2011) and then their dry weights were taken. All chemicals used for the analysis of soyawaste, soil and irrigation water were of AR/GR grade.

3. Results & Discussion

3.1 Experimental observations

Table 1 shows the results of physico-chemical parameters of soya waste and water. From this Table, it is clear that soyawaste contains excess TDS (1786ppm), Chlorides (1.7me/L), Sodium (0.87 me/L), Ca (3.8 me/L), Mg (2.2me/L), Sulphates (3.21me/L), K (0.47me/L), pH (7.70) and considerable amount of micro and macro plant nutrients. The physico-chemical characteristics of the soils S_1, S_2 and S_3 are shown in Table 2. Observations of growth of soyabean plant with respect to plant height, number of leaves, flowers and fruits (maximum values) after three months.

Table 1 - Physico-chemical characterization of Soyawaste (S.W.) and irrigation water

Sr. No.	Parameters	Soyawaste	Irrigation water
1	TDS (ppm)	1786	892
2	pH	7.70	7.33
3	E.C. (mS/cm)	1.333	3.23
4	Calcium (me/L)	3.8	4.8
5	Magnesium (me/L)	2.2	2.2
6	Sodium (me/L)	0.87	0.77
7	Potassium (me/L)	0.46	0.43
8	Bicarbonates (me/L)	1.6	2.5
9	Chlorides (me/L)	1.7	2.3
10	Sulphates (me/L)	3.17	1.54

Table 2- Physico-chemical analysis of three different soils

Sr. No.	Parameters	S_1	S_2	S_3
1	Bulk density (g/cc)	1.49	1.61	1.78
2	W.H.C. (%)	75.83	75.83	58.42
3	pH	7.63	7.70	7.65
4	Conductivity (mS/cm)	0.51	0.53	0.50
5	Available P (kg/ha)	16	18	20
6	Available K (kg/ha)	552	625	298
7	Na (%)	0.52	1.78	0.63
8	Organic C (%)	0.39	0.34	0.49
9	Ca (%)	36.0	27.0	29.2
10	Mg (%)	3.7	9.2	3.7
11.	Porosity (%)	60.05	54.52	35.63
12.	Moisture (%)	8.99	7.16	10.02
13.	Zn (ppm)	0.25	0.48	0.47
14.	Cu (ppm)	1.16	2.84	1.41
15.	Fe (ppm)	0.29	0.56	0.64
16.	Mn (ppm)	2.04	5.21	1.62

The field experiment was started from November 2010. it was observed that, the optimum values of plant height (17.0 inches), number of leaves (76), flowering (36), number of fruits (23) and dry weight (8.2g) in S_1 was recorded at 10% blending. In case of S_2,the highest values of plant height (15.5 inches), number of leaves (75), flowering (43), number of fruits (20) and dry weight (7.0g) was found at 5% blending. Similarly, in S_3 the optimum values of growth parameters were reported at 5% blending concentration as plant height (17.5 inches), number of leaves (91), flowering (49), number of fruits (30) and dry weight (8.9g). The fairly good results for S_3 may be attributed to the better % of organic C, P and Fe in S_3. However, higher or lower blending concentrations of the soyawaste than these in respective soils decreased the growth parameters of soyabean plant. These findings are in accordance with the observations recorded by (Somashekar et al., 1994) in jowar, bajra and rice. Thus, 10% blending for S_1 and 5% blending concentration for S_2 and S_3 proved to be the optimum level blending concentrations.

From the commercial view point, overall maximum number of fruits was found in at 10% blending for S_1, S_2 and 5% for S_3 (Figure 1). This indicates that, the ingredients present in the blends of soyawaste and soil at particular concentration are supportive to the overall plant growth. This promotional influence on the plant growth might be due to the optimum level plant nutrients in the effluent at these blends. The use of soyawaste at these concentration resulted in reduced toxicity and better utilization of plant nutrients. Similar results were obtained(Sahai et al, 1983), in rice crop wherein they noticed that at 5% effluent concentration, the overall growth was better than in control whereas at higher concentration the growth was retarded.

(Shrivastava et al, 2011) studied the effect of effluent of paper mill industries on seed germination and early growth performance of Reddish and Onion. He found that germination and early growth were decreased by Chloro-Alkali paper effluent. (Islam et al, 2006) studied the impact of effluents on plant growth and soil properties and observed that the contaminated soil exerted significant negative effect on the growth, yield and nutrition of rice and grass plant grown in it and the reduction were more pronounced in rice. Some negative effects are also reported in the literature; however, it is a matter of proper balancing of what is needed to the plants and what is present in the wastes.

4. Conclusion

Thus, 5%-10% Soyawaste-soil blending concentration was found beneficial for the growth and yield of Soyabean plant. That means soyawaste acts as an excellent source of essential nutrients for appreciably improving the texture and fertility with significant increase in crop yield over the control at a particular concentration only and is supportive to plant growth. Hence, there is an opportunity with soyawaste to be used as an eco-friendly and non-conventional fertilizer at proper blending. However there is a need of detail and time series study to declare it is totally safe and eco-friendly to be used as fertilizer.

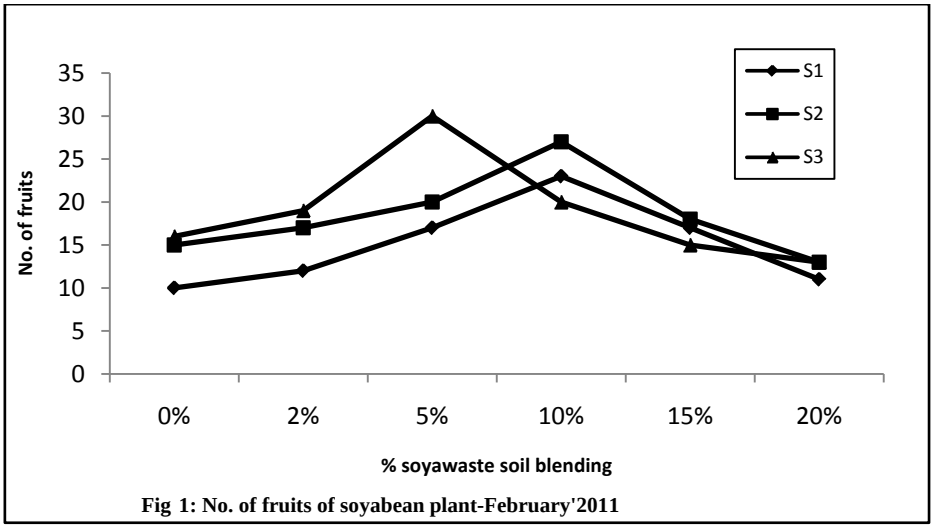

Fig 1: No. of fruits of soyabean plant-February'2011

Fig. 1 - (a) first picture; (b) second picture.

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6.References

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