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Studies on the Effect of Foam Industry Effluent on Phaseolus Vulgaris Var. Contender.l

KEYWORDS: Foam industry, Effluent, *Phaseolus vulgaris*,Var. Contender.L., Jammu, Impact

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ABSTRACT *The use of industrial waste water in irrigation for crops is a recent phenomenon. A large number of industrial wastes and effluents have been successfully used for irrigation of crops with and without any treatment. The present study has been conducted on the effect of foam industry effluent on percentage seed germination and growth parameters of Phaseolus vulgaris var.contender.L. The untreated foam industry effluent of 25%, 50%, 75% and 100% was given to soil in different experimental sets at regular intervals. The untreated foam industry effluent was diluted with distilled water. The study was also made on the seeds soaked in 100% effluent concentration for 24hrs and 48hrs. A control set with no effluent treatment to soil or seed was maintained for comparison of results. The effects of effluent at various concentrations were studied on percentage seed germination, root length of plants, shoot length of plants, number of leaf appendages, number of nodules per plant, total number of flowers, average pod length, average seed number per pod and percentage of seedless pods.*

It has been observed that the 25%, 50%, 75% and 100% untreated effluent affected all the parameters. The seed soaked in 100% effluent for 48hrs failed to germinate even on 13th day and on 20th day. Only 3% seed germination was observed but these seedlings could not survive after 8 days. However, in comparison with control set plants, it can be concluded that the foam industry effluent is detrimental for plants at all the above said concentrations i.e. effluent treatment at all the concentrations has induced seed less-ness thereby decreasing the yield. Thus it is concluded that untreated foam industry effluent cannot be diverted towards agricultural nor they can be recommended for the irrigation before properly treated in ETP or CEPT.

Introduction:
Today the nature and environment which gave birth to man and nursed him is in peril. The commercial production of goods by using advance modern technology has led to development of industries on large scale and it has brought a significant change in economy of the world. Industrialization an important part of human activity and powerful agent of global change accounts for about 20% employment and 40% of valuables added. But there are many negative impacts of the industry like overcrowding, health effects, corrosion of structures and utensils for making new products, damage to buildings and monuments and loss of yield of crops.

The disposal of untreated industrial effluents into the environment has caused a lot of damage to the soil and vegetation. The industrial wastes generated and disposed off in the backyard at the end of manufacturing process.

The use of industrial waste water in irrigation for crops is a recent phenomenon with scientific attention towards this being focused only after 1940 when the problem of fresh water pollution due to the waste water disposal became acute. A large number of liquid wastes have been tested on the crops to study their impacts include Scott, 1982; Fisk, 1964; NEERI, 1979 etc.

Latex rubber foam finds wide applications in the field of transport and tourism industry as well as the household items such as mattresses, pillows etc. Its demand in the recent past has been growing substantially with the availability of the indigenous machines and technology for the manufacture of rubber foam.

The present study was aimed at finding out the impact and the minimum concentration of untreated effluents of the foam industry detrimental to the growth of *Phaseolus vulgaris* var contender L.

Materials and methods:
Tested seeds of *Phaseolus vulgaris* var contender L. were used procured from the Directorate of Agriculture, Talab Tillo Jammu (J&K). The polythene bags of 2kg capacity were used. The untreated effluents were obtained from one of the foam industry at Gangyal Jammu. The untreated effluent samples were obtained at regular intervals. The garden soil with equal quantity of farm yard manure was obtained from the botanical garden of the Jammu University for the experiment. Standard methods were used for the entire experiment.

Seven sets of polythene bags each comprising of 10 bags were made filled. One set for control, 4 sets for the effluent treatment of soil and one set each for seeds soaked in effluent treatment for 24hours (500 seeds) and 48 hours (100 seeds) respectively. The effect of untreated effluent of foam industry was studied by installing three types of experimental sets.

Control set:- In this set of 10 bags, no treatment of effluent was given to the soil or seeds.

Soil treatment sets:- In the sets (I-IV) of 10 bags each, effluent of different concentrations were added to the soil at interval of 5 days during the first month of the experiment, at interval of 10 days during second month of the experiment and at interval of 15 days during third month of the experiment after sowing. The different concentrations of effluent used were 25%, 50%, 75% and 100% for set-I, II, III & IV respectively.

Seed soaked treatment sets (V & VI):- Seeds in set-V were soaked in 100% effluent for 24 hours prior to sowing whereas seeds sown in set-VI were soaked in 100% effluent for 48hours prior to sowing.

Results and discussion

The foam industry untreated effluents which have been used in the present studies were obtained from one of the foam industry at Gangyal Jammu (**Fig.1**) which inhibited the seed germination when seeds were soaked in effluent for 48hours before sowing. The percentage seed germination was only 3% and first seed germinated on 14th day after sowing, whereas in the control set percentage of seed germination was 66% and 19% seeds germinated on 6th day after sowing. The percentage of seed germination in other sets (i.e. set I, II, III and IV) decreased with increase in concentration of effluent as compared to that of control set. The percentage seed germination was less (35%) when seeds were soaked for 24 hours before sowing.(**Table-1**). This observation finds support from the work of Sahai and Srivastava (1986), Dayama (1987), Rajendrababu (1987), Sahai and Srivastava (1988 a), Gupta (1991) on different crops using different types of industrial effluents.

The root and shoot length of the seedlings was also affected. In control set the average root length of the 90 day plant was 7.94 cms and shoot length was 34.6 cms with a root-shoot ratio of 0.22. The effect of effluents on the root and shoot length was less in set-V (24hours seed soaked effluent treatment) as compared to other sets in which effluent treatment was given at regular interval. This was due to fact that no more effluent was added in set-V and the effect of effluent on the seed got diluted with time having no effect on the plants. In set-VI (48hours seed soaked effluent treatment) none of the seedling survived on 8th day after their germination. Gautam and Bishnoi (1990) while working on the effects of dairy effluent on growth of wheat plant observed that the growth of above ground part was better in diluted effluent than in pure effluent and control. The work of Gupta and Nathawat (1992) on the effect of textile effluent on *Pisum sativum* also opined similarly.

The average number of leaf appendages (leaflets as well as stipules) were more in set-V (24hours seed soaked effluent treatment) as compared to that of control set at all ages of plants from 10 to 90 days of age, but in all other sets (I, II, III &IV) the average number of leaf appendages were less as compared to that of control set from 10 days old plant to 90 days old plant.

The average number of nodules per plant was more in set-I (25% effluent soil treatment) as compared to all other sets in 70 days old plant. But in 90 day old plant the numbers of nodules were more in set-V as compared to that of control set and in all other sets, number of nodules per plant was less than that of control set. The 100% effluent treatment to soil inhibited the production of nodules at all ages, no nodule was observed in set-IV.

Total numbers of flowers per set were more in set-V than that of control set and in all other sets the numbers of flowers were less as compared to that of control set in the 60 days old plants.

At the time of maturity the quantitative morphology of pods reveal that pods from set-V (seeds soaked in 100% effluent for 24 hours before sowing) were longer with more number of average seeds per pod and high percentage seedless pods as compared with average pod length, average seed per pod and percentage of seedless pods of control set respectively (**Table-2**).

Average pod length and number of seeds per pod of set-I, II, III & IV was observed to be less than that of control set but %age of seedless pod was more in all these sets. (i.e. I, II,III and IV) as compared with that of control set. The %age of seedless pods were observed to be maximum (50% in set-IV with 100% effluent treatment of soil) followed by set-III, II and I.

Conclusion

The present studies were aimed at finding out the impact of untreated effluent from foam industry at Gangyal Jammu. From these observations it can be concluded that increase in concentration of foam industry effluent is responsible for seedlessness. It can also be concluded that untreated foam industry effluent ultimately affects the yield of *Phaseolus vulgaris* var contender L. The treatment of effluent to soil was observed to be more toxic than to the seed. But the treatment of effluent to seed for prolonged 48hours proved to be lethal. Therefore, this effluent cannot be recommended to be discharged into the agricultural fields or for irrigation purposes. If at all this effluent has to be diverted, it must be diluted to at-least 25% concentration before treatment. It becomes obvious to further carry these studies forward with physic-chemical analysis of the effluents which was not possible in this study due to the lack of laboratory facilities. Also these impacts can be studied in the field which receives these industrial foam effluents.

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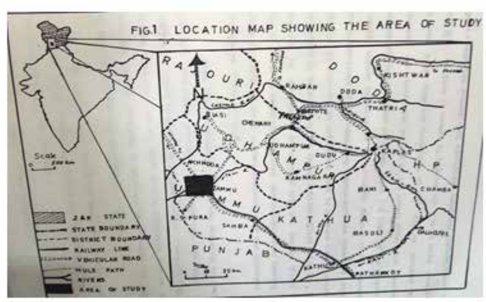

Fig.1. Showing the collection centre of foam industry effluent with the unit (Industry).

Plate-1: photo.1. Pot mill showing mixing of latex with stabilizer and sensitizer.
Photo.2. Beaters showing foaming of mixture.

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Plate-II: photo.1. Pouring of mixture into moulds.
Photo.2. Vulcaniser showing sponging of mixture.

Plate-IV: Photo.12 showing height of plants on 80th day in control set.
Photo.13 showing height of plants on 80th day seed soaked in 100% effluent for 24 hours.
Photo.14,15,16 & 17 showing height of plants on 80th day in 25%,50%,75% & 100% respectively treated with foam industry effluent.

Plate-III: photo.1. foam after release from moulds.
Photo.2. squeezing of foam rubber between rollers.
Photo.3. waste water after squeezing and washing of beaters.

Plate-V: Photo above showing height of plants on 90th day in control set, set-I, set-II, set-III & set-IV.
Photo below showing pods harvested from control set, set-I, set-II, set-III & set-IV.

Name of experimental set	Percentage seed germination (6th day to 20th day)	Root length Range (10th day to 90th day)	Shoot length Range (10th day to 90th day)	Root-Shoot ratio Range (10th day to 90th day)	Number of leaf appendages (leaflets & stipules) (10th day to 90th day)	Number of nodules/plant (10th day to 90th day)	Number of flowers/set (10th day to 90th day)
Control set	19 – 66 (74)	4.1±0.5 to 7.94±0.96	10±1.1 to 34.6±1.0	0.19 to 0.41	18 to 33(Avg. 26.6)	2 to 10 (Avg. 4.3)	3 to 30(Avg. 7.7)
Set-I	15- 64 (48.5)	3.9±1.03 to 7.42±0.37	9.3±1.0 to 32.0±0.9	0.19 to 0.41	15 to 30(Avg. 24.0)	2 to 13(Avg.5.6)	1 to 18(Avg. 3.4)
Set-II	14- 63 (48.2)	3.5±0.4 to 6.62±1.0	8.6±1.0 to 29.3±0.9	0.18 to 0.40	12 to 27(Avg. 20.3)	1 to 10(Avg.3.6)	1 to 16(Avg. 2.7)
Set-III	10 – 62 (47.0)	3.0±0.3 to 5.64±1.0	8.1±0.3 to 26.8±1.0	0.17 to 0.37	09 to 24(Avg. 17.3)	1 to 5(Avg.1.5)	1 to 8(Avg. 1.4)
Set-IV	12 -58 (44.7)	2.1±0.09 to 4.1±1.04	7.9±1.0 to 24.7±0.5	0.12 to 0.26	06 to 21(Avg. 14.3)	--	2 to 8(Avg. 1.1)
Set-V	8 -35 (20.1)	3.37±1.0 to 8.2±1.0	7.0±0.6 to 29.5±0.5	0.25 to 0.48	21 to 36(Avg. 29.6)	2 to 14(Avg.5.7)	8 to 35(Avg. 9.4)
Set- VI	0 -3 (1.1)	None of the seedling survived	None of the seedling survived	None of the seedling survived	None of the seedling survived	None of the seedling survived	None of the seedling survived

Table 1: Impact of foam industry effluent on *Phaseolus vulgaris* var.contender.L.

Control set:	**Without any treatment to soil and seed**
Set-I:	**25% foam effluent treatment to soil**
Set-II:	**50% foam effluent treatment to soil**
Set-III:	**75% foam effluent treatment to soil**
Set-IV:	**100% foam effluent treatment to soil**
Set-V:	**Seeds soaked in 100% foam effluent for 24 hours before sowing**
Set-VI:	**Seeds soaked in 100% foam effluent for 48 hours before sowing**

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Table 2: Impact of foam industry effluent on quantitative morphology of pods of *Phaseolus vulgaris* var.contender.L.

Parameter	Name of experimental set						
	Control set	Set-I	Set-II	Set-III	Set-IV	Set-V	Set- VI
Pod length (cm)	4.0±1.5 (1.9 - 8.6)	3.5±1.7 (1.6 – 7.6)	3.2±1.7 (1.2 – 6.4)	3.0±1.6 (1.3 – 5.1)	2.9±1.4 (1.2 – 4.7)	5.8±3.5 (1.5 – 13.1)	None of the seedling survived
Seed number /pod	2.23	144	1.83	2.0	1.5	2.6	
Percentage of seedless pods	21.73%	30.76%	36.36%	40%	50%	27.77%	

Control set: **Without any treatment to soil and seed**
Set-I: **25% foam effluent treatment to soil**
Set-II: **50% foam effluent treatment to soil**
Set-III: **75% foam effluent treatment to soil**
Set-IV: **100% foam effluent treatment to soil**
Set-V: **Seeds soaked in 100% foam effluent for 24 hours before sowing**
Set-VI: **Seeds soaked in 100% foam effluent for 48 hours before sowing**

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