The effect of industrial wastewater in seed Growth rate: A Review

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Abstract- Environmental pollution constitutes a great health hazard to human, animals and plants with local, regional and global implications. Pollution has adverse effects on land, water and its biotic and a biotic components. Effluents from industries are normally considered as the main industrial pollutants containing organic and inorganic compounds The increasing agricultural reuse of treated effluent serves goals such as promoting sustainable agriculture, preserving scare water resources, and maintaining environmental quality. Moreover, irrigating with waste water may reduce purification levels and fertilization costs, because soil and crops serve as bio-filters, while waste water contains nutrients. Bio assays can be used to measure putative environmental risks. They are reliable, cost effective, quick and simple. The use of plants offers an advantage over other organisms because they can be more sensitive to environmental stresses. They are also easy to manipulate and store and furthermore, they offer a low-cost and good correlation. Use of industrial effluents for irrigation purposes is a highly warranted utility of water pollutants proposition. The objective of using waste water for irrigating crop plants. The first and foremost of this is the safe disposal of the effluents, which may otherwise have adverse effects on the environment and human health. The other objective is to recycle it as irrigation water, as compost for its possible fertilizer value. The literature relating the influence of industrial waste water on seed and seedling quality characters irrespective of crops.

Index Terms- agriculture, environmental, irrigation, pollution, seed, waste water.

I. Introduction

With increasing global population, the gap between the supply and demand for water is widening and is reaching such alarming levels that in some parts of the world it is posing a threat to human existence. Scientists around the globe are working on new ways of conserving water. It is an suitable time, to refocus on one of the ways to recycle water -through the reuse of urban wastewater, for irrigation and other purposes, Srivastava, 1991 [1].

The disposal of wastewater is a major problem faced by municipalities, particularly in the case of large metropolitan areas, with limited space for land based treatment and disposal. On the other hand, wastewater is also a resource that can be applied for productive uses since wastewater contains nutrients that have the potential for use in agriculture. Thus, wastewater can be considered as both a resource and a problem. Wastewater and its nutrient content can be used extensively for irrigation and other ecosystem services. Its reuse can deliver positive benefits to the farming community, Hari,*et al*,1994 [2].

II. Effect on Horticultural Crops

A. Vegetables

Srivastava, 1991, [1] Evaluated the paper mill and chlor-alkali plant effluent (CAP) on seed germination of healthy seeds of radish and onion in different dilutions of effluents and revealed that the percent germination was further with lesser concentrations of the effluents when seeds treated for one to five days all. In the case of radish, at 10% concentration of the effluents, there was a important reduce in mean root length, shoot length and secondary roots as compared with control, while no secondary root could appear out in 100% concentration of CAP effluent. Low dissolved oxygen linked with high mercury and residual chlorine content in effluent affected negatively the germination and later growth of seedlings. In bhendi the germination per cent age was better by 15% with tap water and 25% with spent wash, Hari,*et al*,1994 [2].

Ramana, *et al*, 2002 [3] To experiment a laboratory to study the effect of different concentrations (0, 5, 10, 15, 20, 25, 50, 75 and 100%) of distillery effluent (raw spent wash) on seed germination (%), speed of germination, acme value and germination value in some vegetable crops viz., tomato, chilli, bottle gourd, cucumber and onion. The distillery effluent did not explain any inhibitory effect on seed germination at low concentration except in tomato, but in onion the germination was much higher (84%) at 10% concentration as beside 63% in the control. Irrespective of the crop species, at highest concentrations (75 and 100%), complete crash of germination was noted. The speed of germination, acme value and germination value too followed a like trend and found that a concentration of 5% was critical for seed germination in tomato and bottle gourd and 25% in the rest of the crops. Based on the easiness to distillery effluent, the crops studied have been arranged in the following order: cucumber>chilli>onion>bottle gourd>tomato. So the effect of the distillery effluent is crop-specific and due care should be taken before using the distillery effluent for pre-sowing irrigation purposes.

Dixit, 2003, [4] Experimented bioassay studies to Evaluation the toxicity of raw and diluted distillery effluent on seed germination, seedling growth and pigment content of sugar beet by collecting effluent samples from the main hole of the Sri Gang an agar Sugar Mill factory, in Rajasthan. Seeds kept moist in different dilutions (1, 5, 10, 20 and 30%) of effluent solution, the length with double distilled water, which served as the control shown that top concentrations (>5%) of effluent were found to be toxic, however, the effluent be able to be used for irrigation purposes after suitable dilution.

Sharma, *et al*, 2002 [5], Studied the effect of fertilizer factory effluents (0, 1, 2, 5, 10, 25, 50 and 100%) on seed germination of tomato cultivars PED, Pusa Ruby and Rupal-I. The percentage germination step by step decreased with rising concentration of effluents. Germination increased of 25% effluent concentration. Higher concentrations (50 and 100%) showed adverse impact on germination, Soundarrajan, and Pitchai, 2007 [6] found that application of spent wash diluted at higher level (50 times) has increased germination per cent age, growth fruit yield and fruit quality of Bhendi in a pot culture experiment. In a study were held by, Yadav, and Meenakshi, 2007 [7] to assess the toxicity of effluent on seedling germination, seedling growth, biomass and crop yield of *Raphanus sativus* var. Pusa Chetki (Raddish) and *Hibiscus esculentus* versha uphar (Bhendi). The germination per cent decreased with rising of the effluent concentration.

B. Spices and aromatic plants

Found that 100% sewage concentration on *Trigonella foenum* (Fenugrick) decreased the germination, length of root and shoot from 42 to 32%, 2.10 to 1.49 cm and 2.08 to 1.49 cm, respectively. This study has showed that 10% sewage showed maximum germination, shoot length and root length, Muthalagi and Mala, 2007 [8].

III. EFFECT ON AGRICULTURE CROPS

A. Rice

Behera and Misra, 1982 [9] Studied the impact of distillery effluents on growth and advance of rice seedlings and reported that the germination per cent, number of roots, shoot and root length, fresh and dry weight of the seedlings showed an opposite relationship with effluent concentration.

According that rice seeds treated with different concentration of spent wash (0, 5, 10, 25, 50, 75 and 100%). At higher concentration (25% and above) both the speed of germination and seedling growth were retarded. At 5% concentration by and large growth of seedling was better than in control and suggested that by diluting the effluent to 5% the effluent can be used as a alternative for chemical fertilizers. The chlorophyll A and B decreased with raise in the effluent concentration. The carotenoid content continued to raise up to 5% effluent concentration, Sahai, *et al*, 1983 [10].

Pre soaked the rice seeds in varying concentrations of cardboard factory effluent for 15 and 24 h and germinated in distilled water while another set was germinated under continuous application of a variety of concentrations of effluent. They noted an inhibition in germination with rising the concentrations of effluent as well as increasing the pre-soaking time. The seeds germinated in continuous application of effluent exhibited a maximum of 62% germination in 25% concentration and a minimum of 8% germination in pure effluent (100% concentration). The seeds pre soaked for 15 h showed better germination than those pre soaked for 24 h. The germination capacity decreased with increase in concentration of effluent as well as increasing the pre-soaking period. The seeds, which were supplied with 25% of effluent continuously, showed better growth as compare to control. When seeds were pre-soaked in 25% and 100% effluent showed higher cat ion concentration that had adverse effect on seed germination and seedling quality characters. However, when the concentration range is between 2.5 to 5.0%, no significant deviation in the germination per cent age was noted but at 50% effluent only 15% of rice seeds germinated. With more raise in effluent concentration late in primary root emergence was noticed, Dixit, *et al*, 1983 [11].

In this study the effect of distillery effluent on seed germination and early seedling growth of rice and reported that the processed effluents were rich in inorganic constituents like ammonia cal nitrogen, chemicals and traces of heavy metals and these markedly suppressed the germination per cent and early growth of the seedling as the concentration of the effluent increase, Rajaram and Janardhanam, 1988 [12].

Rajannan, *et al*, 1998 [13] also studied the effects of tannery effluent at different concentrations (25, 50, 75 and 100%) on seed germination of *Oryza sativa* and found that the germination was inhibited by 25 and 50% effluent and fully dormant by 75 and 100% effluent. Even the chlorophyll and protein contents of plants were found to reduce with the effluent concentration of 75 and 100%.

Application of spent wash with 50 times dilution in rice (CO43) resulted in normal yield. The maximum grain yield was recorded in rice variety ADT 42 due to 75 times diluted distillery spent wash treatments which was on par with 100 times diluted spent wash application, Karunyal, *et al*, 1994 [14].

Chinnusamy,*et al*, 2001 [15] Studied the effect of treated distillery effluent on two cultivars of *Oryza sativa* L. Cv. Saka-4 and Pusa 44 after diluted with tap water viz., 100, 50 and 25% in Petri plates over the control. It was observed that root length, shoot length fresh weight root and shoot, dry weight of root and shoot germination relative index, vigour index, emergence index and chlorophyll content were higher in 25% than 50% over control. Rani and Alikhan, 2007 [16] Noticed that the per cent age germination and seedling energy of rice and wheat reduced significantly with a raise in spent wash concentration.

B. Wheat

Soaked the Cv. Kalyansona after surface sterilization in different effluent concentrations from simple tannery effluent and shown that up to 5% concentration, germination treatment had stimulating effect, while more raise in concentration of the effluent, a matching reduce in germination per cent occurred due to reduction of dissolved oxygen, both by chemical and biological oxidation of sulphur and organic compounds. They also reported that absorption of higher dissolved solids by the seed also could have affected the germination, Singh, *et al*, 2007 [17].

Mishra and Bera, 1995 [18] Showed that olive Mill waste water had phototoxic influence on wheat Cv. Ofonto due to the polyphenols and other unidentified Material. Aliotta, *et al* 2002 [19] conducted laboratory experiments to study the effect of textile effluents at different concentrations in the range of 0-100% (untreated and treated) on seed germination (%), delay index (DI), plant shoot and root length, plant biomass, chlorophyll content and carotenoid of three different cultivars of wheat. The textile effluent did not note any inhibitory effect on seed germination and other plant characters at low concentration (6.25%). Seeds germinated in unlighted effluents did not continue to exist for longer time. Based on the acceptance to textile effluent, the wheat classes have been arranged in the subsequent order: PBW-343 < PBW-373 < WH-147. It has also been completed that effect of the textile effluent is cultivar definite and due care should be taken before using the textile effluent for raw purpose.

C. *Sorghum*

Activist influence of distillery waste water on sorghum yield has also been noted by Kaushik, *et al, 2005* [20]. The shoot and the root length and the number of on the side roots shaped in the case of sorghum reached maximum values when treated with 2.5% distillery spent wash. Zalawadia and Raman, 1994 [21] Too showed that the distillery spent wash did not note any inhibitory effect on seed germination at low concentration. The spent wash at a upper concentration decreased the seed germination. But up to 10% concentration the distillery spent wash noticeably better the seed germination and seedling growth in White sorghum (APK 1) and Red sorghum (Namakkal local).

D. *Pearl millet*

Kalaiselvi, *et al*, 2009 [22] Reported that soap factory effluent was toxic to seed germination and seedling growth of finger and pearl millet, but when the effluent was diluted to 2.5 to 5.0% it improved the seed germination and seedling growth.

E. *Maize*

Vijayakumari, 2003. [23] expressed that Olive Vegetable Water (OVW), the liquid by - product obtained from olive processing to extract virgin olive oil by mechanical means (pressure and centrifugation systems) and spread OVW in large quantities on soil cultivated with maize revealed that the use of large quantities of OVW (more than 10 L m^{-1}) gave a 30-40% increase in the total biomass production compared with the control. All the parameters, i.e., germination, stalk, ear and dry kernel per plot in maize were also increased by large quantities of OVW. The grain yield and biomass yield of maize was significantly higher due to spent wash application. The spent wash also increased the N, P, K, Ca, Mg and Na content in all the parts of the maize crop, Giovacchino, *et al*, 2001 [24].

IV. EFFECT ON TREE SPECIES

Gomathi, and Oblisami, 1992 [25] stated that pulp and paper mill effluent could also be used for irrigating tree crops after proper dilution. Germination per cent age decreased from 100 to 75% due to irrigation with paper mill effluent at 100% concentration. The length of the root and shoot and strength index of the tree types viz., neem, pungam and tamarind, reduced considerably. But on application of effluent at concentrations of 25, 50, 75 and 100% at 100 mL day^{-1}. Using 25 and 50% concentrations, the effluent had no inhibitory effect in germination. A 25% effluent was like to that of normal water for raw.

Effects of tannery effluent on seed germination of *Acacia holosericea* and *Leucaena leucocephala* were studied. The effluent was diluted to 25, 50, 75 and 100% concentrations. Twenty five and 50% effluent inhibits seed germination and completely dormant by 75 and 100% effluent. Even the chlorophyll and protein contents decreased with 75 and 100% effluent concentration, Rajannan, *et al*, 1998 [13].

V. CONCLUSION

Review of work done by the various authors revealed that irrespective of the type of effluent, these could be well utilized for betterment of agricultural crops on proper dilution to evade the lethality of the pollutants. This diluted effluent could be used both foe invigorating the seed and for further irrigating the crop or the nursery in case of tree seeds depending up on the availability of the effluent specific to site as the case may be giving way to utilize the waste material for betterment of the mankind without causing ill effects to human and animals. The effluents on proper dilution can be also be materialised as cash by proper sale of the product thus the review fresh up the idea of motility of waste material.

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