J. Indian bot. Soc. Vol. 89 (1 & 2) 2010 : 222-224

PAPER MILL EFFLUENT INDUCED DIFFERENTIAL RESPONSE OF TWO WHEAT CULTIVRS

SANJEEV KUMAR AND PRATIKSHA MAHESHWARI
Department of Botany, DAV (PG) College, Muzaffarnagar-251001,India

Triticum aestivum cv PBW-373 &PBW- 343 were irrigated with different diluted concentration of paper effluent ,insignificant effect in terms of length of root and shoot ,but increase in biomass and yield in case of cv PBW-373.Inhibitory response was seen in cv PBW-343. Level of chlorophyll, nitrogen and sugar decreased in shoots of cv PBW- 373 in less diluted concentration. Maximum dilution caused an increase in chlorophyll, nitrogen, sugar and protein of shoots and roots of cv PBW-343.

Key Words-Paper mill effluent, chlorophyll, nitrogen protein, sugars, yield ,

Different crops irrigated with effluent of different industries have been reported to show variable response on plant growth and yield (Dutta and Boissya 1997, Himabindu *et al.* 2005) along with accumulation of toxic substances in plant parts (Singh *et al.* 2002).Mishra *et al.* (1991)observed the phytotoxicity of paper mill effluent on *Oryza sativa* L var.IR36. They found significantly inhibited germination, root and shoot growth and also chlorophyll, sugar, protein, amino acid and nucleic acid content.To further understand the response of paper mill effluent on growth, yield and changes in biochemical levels of wheat plant parts ,the present study was undertaken.

MATERIALS AND METHODS

Seeds of *T.aestivum* cv PBW-373&PBW-343 were sown in soil kept in polybags. After seedlings emergence, crop was irrigated with different dilutions of effluent(10%-100%)at alternate days upto three months and thereafter ten plants of each cultivar and of each treated dose were analysed for growth (root and shoot), yield (grains), biomass and biochemical components (total nitrogen, sugar, protein, carbohydrate and chlorophyll).

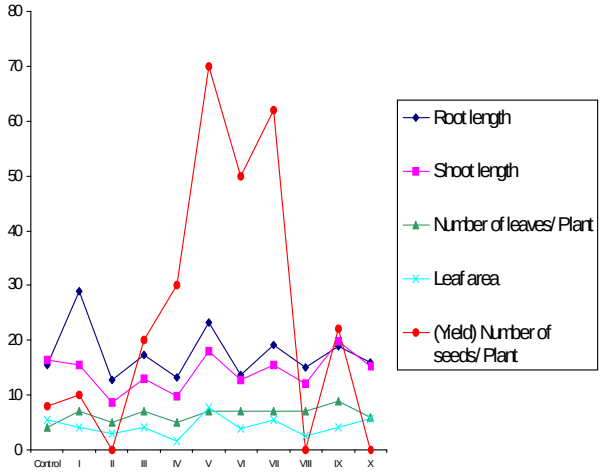
Biochemical Analysis - For detailed studies on biochemical changes in plant parts, two concentrations of effluents (10% and 100%) also have been selected.The following methods and material have been used for analysis-

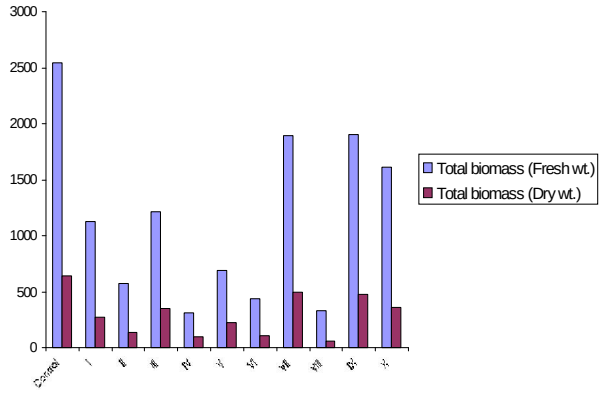
Chlorophyll - Was estimated as per the standard method of Arnon (1949)

Total Protein - Shoot and root protein was estimated by Bradfords method- Bradford (1976) *using* Coomassve Brilliant blue dye *a*nd reading the absorbance at 595 nm.

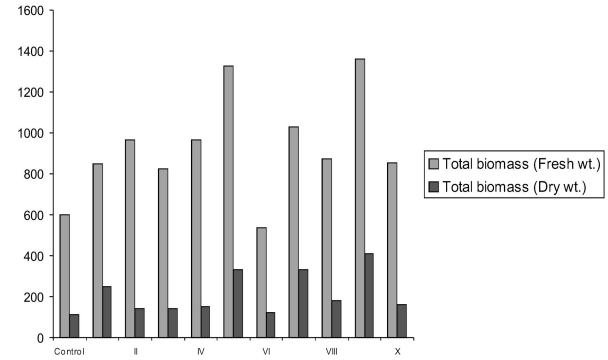
Total Carbohydrate - Dry sample (10 mg each) was digested with 5 ml of 2.5 N HCl for 3 hours and cooled at room temp. It was neutralised with solid sodium carbonate until the effervescence ceased and made up the volume to 10 ml with distilled water. The hydrolysate was centrifuged at 3000 rpm to obtain a clear supernatant. From this supernatant three aliquots of 0.2 ml of each were made and maintained the final volume. to 1 ml with the help of 0.8 ml of distilled water. 4 ml of Anthrone reagent (Hedge *et al.* 1962) was mixed in each replicate, kept in boiling water bath for 8 minutes, cooled rapidly in freeze and read the absorbance at 630 nm. The amount of total sugars was calculated as mg glucose

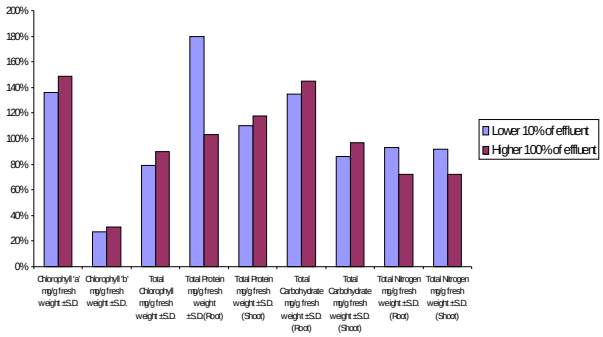
Received on February 9, 2009 Accepted on April 6, 2010



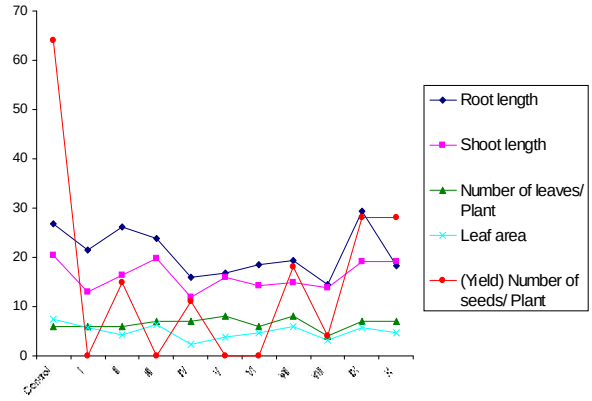


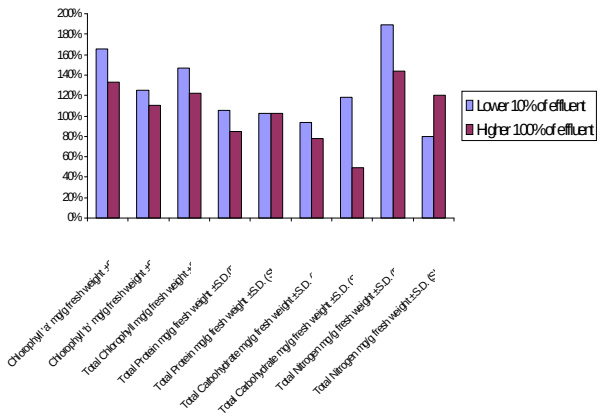
N.B. – Doses I = 10% , II =20%, III =30%, IV =40%, V=50%, VI=60%, VII =70%, VIII =80%, IX =90%, X =100% of effluent.





N.B. – Doses I = 10% , II =20%, III =30%, V =40%, V=50%, VI=60%, VII =70%, VIII =80%, IX =90%, X=100% of effluent.





equivalents per gm dry weight.

Total Nitrogen - Estimation of nitrogen was done according to spectrophotometric method of Snell and Snell(1954) using Nessler's reagent and reading absorbance 430 nm.

RESULTS AND DISCUSSION

After three months of sowing, *Triticum aestivum* cv. PBW-373 underwent a sharp increase in root length,number of leaves per plant, leaf area and yield (number of seeds per plant as compared to control) at 50%, 70% and 90% paper mill effluent treatment(Fig-1). Total fresh and dry biomass of the whole plant also increased over control at the same concentrations of paper mill effluent treatment.(Fig.2)

In contrast *Triticum aestivum* cv. PBW-343 underwent drastic decline in all growth including biomass and yield perameters under all dilutions of paper mill effluent treatment.(Fig.3). However a little, though insignificant recovery of growth, yield and biomass was recorded at 70%and 90% paper mill effluent treatment, yet it remained lower than control.

T. aestivum cv PBW-373 also exhibited increase in chlorophyll a, total carbohydrate and total shoot protein under higher concentration(100%) of paper mill effluent indicating accumulation of phothsynthates (Fig-5).This could be due to less susceptibility of shoots to paper mill effluent as compared to roots, as also reported by Malla and Luna (2005). Besides ,paper mill effluent is reported to be rich in mineral nutrition Misra *et al.* (1991) which could improve growth and yield. However cv PBW-343 exhibited increased total nitrogen at higher paper mill effluent concentration, though increased chlorophyll a, total chlorophyll,total shoot carbohydrate and root nitrogen in lower concentrations of paper mill effluent (10%) (Fig-6). This is against the report of Theil (1984) who noted immobilization of N in the soil, as the N accumulated in root under both high and low concentration of paper mill effluent treatment. Interestingly, increased chlorophyll and nitrogen in content in cv PBW-343 did not support growth and yield of the plant where as accumulation of chlorophyll a, root-shoot protein and root carbohydrate in cv PBW-373 could increase the growth and yield of the plant above control.

Hence, paper mill effluent site can be used for development of T.aestivum cv PBW-373 rather than the other cultivers.

I am very grateful to Prof. Vimala, Head, Bot. Dept. Ch. Charan Singh University,Meerut for help.

REFERENCES

Arnon DI 1949. Copper enzymes in isolated chloroplasts. Polyphenol oxidase in *Beta vulgaris, Plant. Physiol,* **24** 1-15.

Bradford MM 1976 A rapid and sensitive method for quantitation of macrogram quantity of Protein utilizing the principles dye binding.*Anal Biochem.*, **72** 248-254.

Dutta SK & Boissya CL 1997 Effect of paper mill effluents on germination of rice seed (*Oryza sativa* L. Var. Masuri) and growth behaviour of its seedling. *J. Indl Pollen Contl,* **13** (1), 41-47.

Hedge JE & Hofreiter BT 1962. In: *Carbohydrate chemistry* 17 (Eds Whistler RL and Be Miller, JN) Academic Press, New York.

Himabindu T & Reddy JK 2005 Effect of paper board mill effluents on biochemical characteristics of rice (Var. Swarna mahsuri.). *J. Nature Env. Pollen Techno,* **4** (4) 617-619.

Malla Luna & Mohanty BK (2005) Effect of paper mill effluents on germination of green gram (*Phascolus aureus* Roxb.) and growth behaviour of its seedling. *J. Environ Bio,* **26** (2 suppl), 379-382.

Misra RN, Panigrahi GN & Patra KS 1991. Studies on physiotoxicity of paper milleffluent on *Oryza sativa* L. var. IR 36. *J. Bionature,* **11** (1) 99-101.

Singh A, Agarwal SB Rai JPN & Singh P 2002 Assessment of the pulp and paper mill effluent on growth, yield and nutrient quality of wheat *Triticum aestivum* L. *J. Environ Bio,* **28** (3), 283-288.

Snell FD & Snell CT 1954. Colorimetric methods of analysis, 3rd col. 4D-Van Nostrand Company, Inc. New York.

Thiel DA 1984 Sweet corn grown on land treated with combined primary/Secondary sludge. In TAPP I Proc., Environmental Conference. TAPP I Press, Atlanta, 93-103