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INFLUENCE OF TREATED THERMAL POWER PLANT EFFLUENT ON GROWTH PARAMETERS OF *Pisum sativum* L.

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ABSTRACT

In the present study irrigation of *Pisum sativum* L. was done by using thermal power plant effluent. Different concentrations like 20%, 50%, 80% and 100% were made with the help of tap water. Tap water serves as control. Study was conducted up to 20 days followed by maturation. Results were noted on every 5th day after germination in control. Different morphological parameters like number of leaves, shoot length, root length, fresh weight, dry weight, number of pods, number of fruits per plant, weight of whole fruit were checked from the harvested plants. Lower concentration of TPP effluent shows enhancement in plant growth while with higher concentrations retardation in growth was achieved.

KEY WORDS: Thermal Power Plant effluent, Morphology, *Pisum sativum* L., Irrigation

INTRODUCTION

Industries are truly said the back bone for human being as industries play a key role in fulfilling the need of civilization.Basic needs of modern life style start from industries. Industries fully depend on electricity for their optimum working.

Solar power, hydro power, thermal power, wind power etc. are the sources of electricity generation. According to Central Electricity Authority renewable sources of electricity generate 7.8% of electricity of total power generation in India during 2018- 2019 (CEA, 2018 - 19). So in India major source of power generation is coal based thermal power plants.

On other hand by product of TPP is in the form of fly ash, bottom ash, boiler slag and effluent (Mistry and Patel, 2018). Flash as, bottom ash and boiler slag are used as a building material (Nawaz, 2013), brick production (Chauliya *et al*., 2009) and underwater filling material (Horiuchi *et al.,* 2000) respectively. The waste water of TPP is discharge into the natural water source and is used by local farmers for irrigating their lands and cultivating their crops.

Water demand is continuously increasing due to population growth and agricultural water usage, in so many parts of world faces water scarcity (Toze, 2006). To overcome this problem use of effluent is one the best option (Akhtar *et al.,* 2018; Hashem and Qi, 2021). Present investigation deals with the use of thermal power plant effluent for irrigation of *Pisum sativum* L.

METHODOLOGY

Effluent was collected from effluent discharge site of Ukai thermal power plant in pre washed, acid rinsed, dried plastic wear. Pots were chosen for the study. Each pot was filled with healthy agricultural soil. For irrigation of plants four different concentrations (20%, 50%, 80% and 100%) of thermal power plant effluent were made. Tap water was used for diluting the TPP effluent as well as for irrigating the control plants. The experiments were triplicated. Plants were irrigated on every alternate day. Seeds of *Pisum sativum* L. were collected from certified agro.

Study was conducted up to 20 days followed by

maturation. Results were noted on every 5th day up to 20th day. Following morphological parameters were checked from harvested plants.

Number of leaves, shoot length, root length, fresh weight and dry weight were noted from seedlings of 5, 10, 15 and 20 days after germination. Number of pods, number of fruits per plant, weight of whole fruit and number of leaves were noted from mature plants.

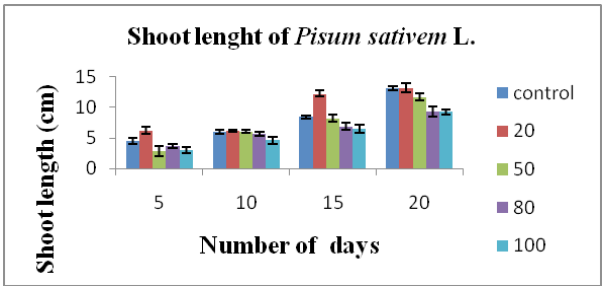
The shoot length and root length were measured in cm by meter scale. The fresh weight, dry weight and weight of whole fruit in g were achieved by Citizon weighing balance. For dry weight of plants, plants were dried in oven at 80ºC for two days till constant weight was achieved.

RESULTS AND DISCUSSION

Figure 1, 2, 3, and 4 show growth of *Pisum stivum* L. with different concentrations of thermal power plant effluent along with control at 5th, 10th, 15th and 20th day respectively. In seedlings of effluent irrigated *Pisum sativum* L. shoot length and root length found to be highest at 20% and decreasing trend was observed with higher concentrations of effluent in comparison to control (Graph 1 & 2). The enhancement of growth at lower concentration might be due to the presences of nitrogen and other mineral elements in effluent which shows promoting effect on plant growth (Panaskar and Pawar, 2011). Sarvanamoorthy and Kumara, 2007 also found enhancement in shoot and root length at lower concentration of effluent.

Numbers of leaves were found upraised in 20%of TPP effluent treated plants (Graph 3). On 5th and 10th day in 50% TPP effluent plants number of leaves found similar with control plants but after that it found lower in comparison to control plants. In other higher concentrations like 80% and 100% of TPP effluent number of leaves were found least in comparison to control. These results are matched with Achuba and Iserhienrhien, (2018).

Fresh weight (Graph 4) and dry weight (Graph 5) were also found on picked at 20% of TPP effluent



Graph 1. Effect of thermal power plant effluent on shoot length of *Pisum sativum* L. at different interval of days

Fig. 1. Shows growth of *Pisum sativum* L. at 5thday after germination in control

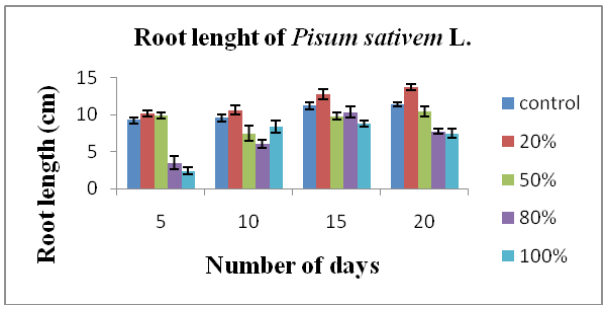
Fig. 3. Shows growth of *Pisum sativum* L. at 15thday after germination in control

Fig. 2. Shows growth of *Pisum sativum* L. at 10thday after germination in control

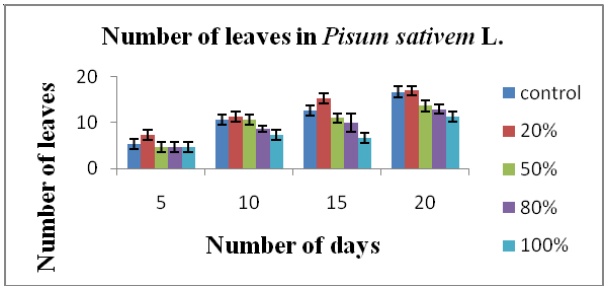
Fig. 4. Shows growth of *Pisum sativum* L. at 20thday after germination in control

treated plants while decreased with higher concentrations of effluent. At lower concentration of effluent fresh and dry weight found increased it might be due to the availability of minerals and salts at lower concentration of effluent (Singh and Rathore, 2021) and retards in above parameters at higher concentration is might be due to the excessive amount of elements are there in concentrated effluent (Kumar, 2006).

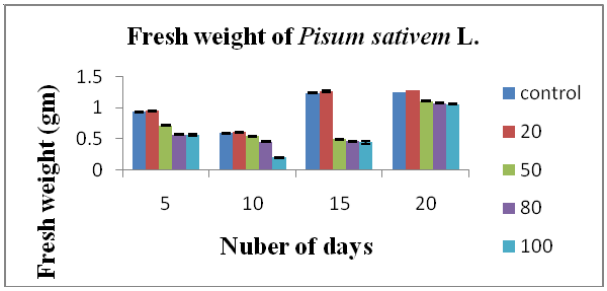
Figure 5 shows growth of *Pisum sativum* L. at vegetative phase which were irrigated with tap water which one considered as a control. Figure 6, 7, 8 and 9 show growth of mature pea, irrigated with different concentrations such as 20%, 50%, 80% and 100% of Thermal power plant effluent respectively.



Graph 2. Effect of thermal power plant effluent on root length of *Pisum sativum* L. at different interval of days

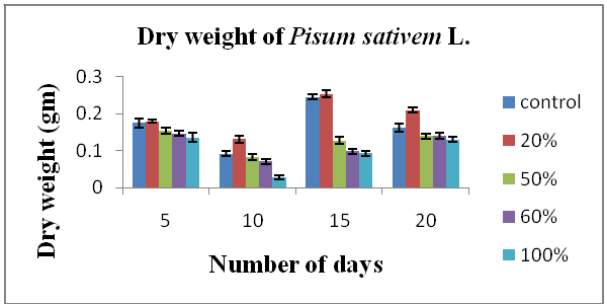


Graph 3. Effect of thermal power plant effluent on number of leaves of *Pisum sativum* L. at different interval of days

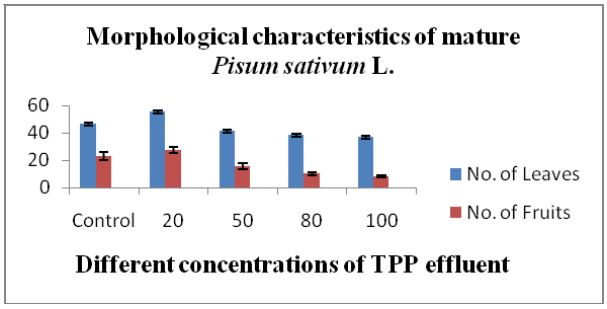


Graph 4. Effect of thermal power plant effluent on fresh weight of *Pisum sativum* L. at different interval of days

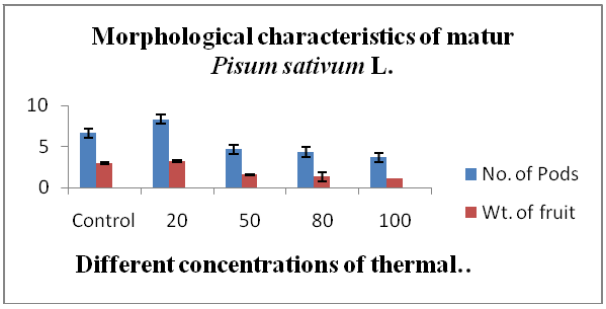
At vegetative phase of plants number of leaves (Graph 6), number of fruits per plants (Graph 6), number of pods (Graph 7) and weight of whole fruit (Graph 7) were found highest at 20% and lowest in higher concentrations. Kumar *et al*., (2010) also found the similar results, at vegetative phase of plant. Better performance was recorded at lower concentration and retardation of growth was there with higher concentration of effluent. Decreasing trend in yield of *Pisum sativum* L. with higher concentrations of effluent was achieved by Singh, (2014).



Graph 5. Effect of thermal power plant effluent on dry weight of *Pisum sativum* L. at different interval of days



Graph 6. Effect of thermal power plant effluent on morphological characteristics like number of leaves and number of fruits of mature *Pisum sativum* L.



Graph 7. Effect of thermal power plant effluent on morphological characteristics like number of pods and weight of fruits of mature *Pisum sativum* L.

Fig. 5. Shows growth of Mature *Pisum sativum* L. at control

Fig. 6. Shows growth of Mature *Pisum sativum* L. at 20% concentration of thermal power plant effluent

When dilution of effluent carried out at a particular dilution, presence of elements were also diluted and come at optimum level which was responsible for the enhancement of growth (Chandraju and Basavaraju, 2007). Osmotic pressure caused by higher concentrations of effluent might be the reason of retardation of growth at higher concentration (Dhanam, 2009; Kapil and Mathur, 2020).

Fig. 7. Shows growth of Mature *Pisum sativum* L. at 50% concentration of thermal power plant effluent

Fig. 8. Shows growth of Mature *Pisum sativum* L. at 80% concentration of thermal power plant effluent

CONCLUSION

The present investigation emphasizes that the lower concentration of thermal power plant effluent does not harm the plant growth while it shows the positive impact on plant growth parameters. So, the use of diluted (Lower concentration) thermal power

Fig. 9. Shows growth of Mature *Pisum sativum* L. at 100% concentration of thermal power plant effluent

plant effluent for irrigation of crops will increase the yield of plant and decrease local water resources availability pressure in various areas.

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Conflict of Interest – None

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