

Influence of Yamuna River Water on Growth and Yield of *Vigna Mungo* (L) Wilczek



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Abstract

In the present study we investigate the effect of different concentrations of Yamuna River water on various growth parameters of *Vigna mungo*. We prepared three different concentrations (25%, 50% & 100%) of Yamuna river water, among which 25 % concentration of Yamuna river water showed minimum inhibitory effect on the seed germination & other growth parameters of *Vigna mungo* over control. Maximum inhibition in the growth parameters was recorded under the influence of 100% of Yamuna river water in comparison to control (Tap Water).

Keywords: Growth, Yield, *Vigna mungo*, Yamuna River water.

Introduction

River Yamuna is one of the most polluted rivers in the world. Industrial and domestic sewage contribute to the extent of 85% of the total pollution load. This water is unfit for drinking, swimming and fisheries. Some factories have its own effluent treatment plant and oxidation pond. Effluent after treatment is discharged into the river. Some cultivators use the treated effluent for irrigation fields and grow vegetables and crop plant. River Yamuna is one of the most polluted rivers in the world. Industrial and domestic sewage contribute to the extent of 85% of the total pollution load. This water is unfit for drinking, swimming and fisheries (Shrivastava et al., 2001). Some factories have its own effluent treatment plant and oxidation pond. Effluent after treatment is discharged into the river. Some cultivators use the treated effluent for irrigation fields and grow vegetables and crop plant. Treatment methods for waste water which are being used in the industries are chemical coagulation, flocculation, sedimentation, floatation, filtration and other biological methods like activated sludge process, trickling filters, stabilization pond, anaerobic digestion and laggoning etc. This effluent treatment plants require high capital and operational cost (Bishnoi et al., 2006). Biological processes are more economical and eco-friendly than advance waste water treatment due to its low running and maintenance cost. It has been established that major contaminants in the waste water includes biodegradable organics, volatile organic compounds, toxic heavy metals, recalcitrant, suspended solids and nutrients. Among all the tributaries of the river Ganga Yamuna is the largest tributary. The main stream of the river Yamuna originates from the Yamunotri glacier near Bandar Punch (38o 59' N 78o 27' E) in the Mussourie range of the lower Himalayas at an elevation of about 6320 meter above mean sea level in the district Uttarkashi (Uttaranchal). Yamuna river covers parts mainly of the states of Uttaranchal, Uttar Pradesh (U.P.), Himachal Pradesh, Haryana, Rajasthan, Madhya Pradesh and the entire state of Delhi. The river Yamuna travels a distance of about 1370 km in the plain from Saharanpur district of Uttar Pradesh to the confluence with river Ganga at Allahabad. Increased urbanization and industrialization within U.P. state in recent years has resulted in the degradation of water resources through different kinds of pollution including the discharges from industries containing heavy metals (Berman et al., 2001). The pollution from metals have deteriorated the quality of water and it is very important to monitor the water bodies continuously in order to take initiatives for the conservation of water in riverine ecosystems including River Yamuna in U.P. which is the lifeline of this state and the whole country. In view of this, the present investigation was undertaken to evaluate the effect of Yamuna river water on the growth parameters of *Vigna mungo*.

Aim of the Study

By the present investigation we study the quality of Yamuna river water by taking samples from three different locations from Mathura, Agra and Etawah respectively and investigated the effect of Yamuna river water on various growth parameters of *Vigna mungo* crop by irrigating it with Yamuna river water.

Material and Methods

The healthy seeds of *Vigna mungo* variety, i.e. PUSA- URD were surface sterilized with 0.1 per cent mercuric chloride for 2 minutes and washed thoroughly with tap water and then with distilled water. Forty seeds of *Vigna mungo* were arranged equispacially in plastic trays lined with filter paper. They were irrigated uniformly with three different concentrations i.e. 25%, 50% and 100% of Yamuna river water which were taken from three different locations in Gokul Bairaj, Mathura, Bateshwar, Agra and Etawah with tap water (Control). For observing parameters such as plant height, 100 seed weight, pods/plant, seeds/plant and yield/ plant, plants were allowed to grow up to full stage. Three replications were maintained for this varietal screening experiment. The statistical analysis of experimental results was carried out by standard deviation. In order to analyze the data statistical tool such as ANOVA was used. Standard deviation calculated by following methods of O'Brien, R. G. (1981).

Results**Location (A) – (Gokul Bairaj, Mathura)**

In the case of 25% treatment the plant height was 58.10 ± 2.06 , in 50% treatment it was 40.90 ± 1.20 , in 100% treatment it was 28.72 ± 1.60 and in the case of control it was 62.12 ± 1.40 . The 100 seed weight was 44.620 ± 2.412 , in 50% treatment it was 30.420 ± 1.940 , in 100% treatment it was 21.500 ± 1.320 and in the case of control it was 50.545 ± 2.530 . The pods/plant was 40.0 ± 1.05 , in 50% treatment it was 30.2 ± 1.14 , in 100% treatment it was 16.0 ± 1.10 and in the case of control it was 42.2 ± 1.09 . The seeds/plant was 360.00 ± 13.86 , in 50% treatment it was 300.14 ± 11.96 , in 100% treatment it was 210.20 ± 10.04 and in the case of control it was 380.10 ± 11.70 . The yield/plant was 20.10 ± 0.02 , in 50% treatment it was 12.90 ± 0.14 , in 100% treatment it was 08.96 ± 0.12 and in the case of control it was 24.16 ± 0.30 .

Location (B) – (Bateshwar, Agra)

In the case of 25% treatment the plant height was 60.45 ± 1.04 , in 50% treatment it was 42.50 ± 2.08 , in 100% treatment it was 30.10 ± 2.42 and in the case of control it was 64.10 ± 0.04 . The 100 seed weight was 45.990 ± 2.212 , in 50% treatment it was 34.100 ± 1.860 , in 100% treatment it was 22.410 ± 2.114 and in the case of control it was 52.105 ± 2.302 . The pods/plant was 42.5 ± 1.42 , in 50% treatment it was 32.8 ± 1.02 , in 100% treatment it was 18.5 ± 1.24 and in the case of control it was 44.2 ± 1.30 . The seeds/plant was 365.05 ± 10.48 , in 50% treatment it was 305.10 ± 12.02 , in 100% treatment it was 215.20 ± 8.54 and in the case of control it was 385.48 ± 6.90 . The yield/plant was 21.70 ± 0.14 , in 50% treatment it was 13.50 ± 0.06 , in 100% treatment it was 09.85 ± 0.18 and in the case of control it was 25.50 ± 0.24 .

Location (C) – (Etawah)

In the case of 25% treatment the plant height was 50.05 ± 1.06 , in 50% treatment it was 34.36 ± 1.12 , in 100% treatment it was 22.80 ± 1.22 and in the case of control it was 61.80 ± 0.04 . The 100 seed weight was 40.108 ± 1.412 , in 50% treatment it was 24.108 ± 2.608 , in 100% treatment it was 16.900 ± 2.340 and in the case of control it was 48.610 ± 1.902 . The pods/plant was 36.2 ± 1.06 , in 50% treatment it was 22.5 ± 1.24 , in 100% treatment it was 12.9 ± 1.94 and in the case of control it was 40.5 ± 1.08 . The seeds/plant was 305.62 ± 12.46 , in 50% treatment it was 268.510 ± 14.02 , in 100% treatment it was 185.182 ± 10.52 and in the case of control it was 365.12 ± 8.04 . The yield/plant was 16.92 ± 0.10 , in 50% treatment it was 10.00 ± 0.02 , in 100% treatment it was 06.12 ± 0.28 and in the case of control it was 20.85 ± 0.12 .

Discussion

According to studies of lot of researchers it is well known that by the irrigation with river water there is a great influence on the growth of plants (Khaliq et al., 2006). By the present investigation it was clearly indicated that as we increase the concentration of Yamuna river water in our experiment the performance of all the growth parameters reduced by these results we can say that the river water have an inhibitory effect on all the parameters regarding growth and yield. By the irrigation of undiluted (100%) effluent produced significant retardation in all the parameters studied such as plant height, 100 seed weight, pods/plant, seed/ plant and yield/ plant (Table-1, 2 and 3). The best performance of test crops in terms of various parameters were in those plants which are treated by 25% followed by 50% and worst in those plants which were treated by 100%. Control plants which were irrigated by the tap water were the best performer. Those plants which were treated by 100% river water showed the symptoms such as burning of leaf tips and formation of loops by the young emerging leaves. These leaves failed to expand, resulting in marked decrease in leaf size. Growth of roots was also inhibited and root tips turned brown and necrotic. Those plants which were irrigated with diluted (50%) effluent produced similar but less severe effects. By the irrigation with 25% treatment there are minimum effects on crop plants. The leaves of *Vigna mungo* seedlings irrigated with the undiluted (100%) effluent failed to unroll and remained needle-like. Their apical part also turned chlorotic. The root tips of the *Vigna mungo* seedlings also turned brown and necrotic. Growth of a large percentage of *Vigna mungo* seedlings was severely arrested beyond 15 days from sowing. Due to presence of heavy metals in Yamuna river water there is clearly inhibitory effect on crop plants our findings were in close resemblance with lots of workers (Ulamen & Roberts., 2006) The visible effects produced in the different parts of plants such as roots and aerial parts of the seedlings show great resemblance to the nickel-toxicity effects.

**Effect of Different Concentrations of Yamuna River Water on Yield Attributes of Vigna Mungo
(Location Gokul Bairaj, Mathura)**

Treatments	Plant Height	100 seed Weight (gm)	Pods/ Plant	Seeds/ Plant	Yield/ Plant
25%	58.10±2.06	44.620±2.412	40.0±1.05	360.0±13.86	20.10±0.02
50%	40.90±1.20	30.420±1.940	30.2±1.14	300.14±11.96	12.90±0.14
100%	28.72±1.60	21.500±1.320	16.0±1.10	210.20±10.04	08.96±0.12
Control	62.12±1.40	50.545±2.530	42.2±1.09	380.10±11.70	24.16±0.30

**Effect of Different Concentrations of Yamuna River Water on Yield Attributes of Vigna Mungo
(Location Bateshwar, Agra)**

Treatments	Plant Height	100 seed Weight (gm)	Pods/ Plant	Seeds/ Plant	Yield/ Plant
25%	60.45±1.04	45.990±2.212	42.5±1.42	365.05±10.48	21.70±0.14
50%	42.50±2.08	34.100±1.860	32.8±1.02	305.10±12.02	13.50±0.06
100%	30.10±2.42	22.410±2.114	18.5±1.24	215.20±8.54	09.85±0.18
Control	64.10±0.04	52.105±2.302	44.2±1.30	385.48±6.90	25.50±0.24

**Effect of Different Concentrations of Yamuna River Water on Yield Attributes of Vigna Mungo
(Location Near Etawah)**

Treatments	Plant Height	100 seed Weight (gm)	Pods/ Plant	Seeds/ Plant	Yield/ Plant
25%	50.05±1.06	40.108±1.412	36.2±1.06	305.62±12.46	16.92±0.10
50%	34.36±1.12	24.108±2.608	22.5±1.24	268.510±14.02	10.00±0.02
100%	22.80±1.22	16.900±2.340	12.9±1.94	185.182±10.52	06.12±0.28
Control	61.80±0.04	48.610±1.902	40.5±1.08	365.12±8.04	20.85±0.12

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