CHAPTER –5

EFFECTS OF POLLUTED HINDANE RIVER WATER ON PLANT GROWTH AND YIELD
The effects of different concentration of polluted river water growth and yield, in some cereals viz. *Triticum aestivum* cv. SFW-75 and *Oryza sativa* PR-14 legumes viz. *Vicia faba* cv. Desi and *Vigna mungo* cv. ND-40 studied, are given here. For growing the plants, soil was taken from the experimental plots of Government Horticulture Research Station and Training Center, Saharanpur. This soil was then filled in several polythene bags and irrigated with equal amounts of 25% and 50% sterilized polluted river water. The seeds of above mentioned cereals and legumes were sown in these polythene bags and were allowed to grow under natural condition. Irrigation with equal amounts of 25% and 50% sterilized polluted river water was provided whenever needed. Simultaneously a control set of each crop was also maintained by irrigating with distilled water. Sampling was done at 30\(^{th}\) and 60\(^{th}\) day of seedling emergence for the growth studies, while in *Vigna mungo* cv. ND-40 plants were sampled at 20\(^{th}\) and 40\(^{th}\) day of emergence. Yield measurements are recorded at 90\(^{th}\) day of emergence in the above crops except in *Vigna mungo* in which it is measured on 60\(^{th}\) day of emergence. Plants were dissected into different parts and analysed for root/shoot length, its fresh and dry weights, nodule number, its fresh and dry weights, pod per plant, pod cover weight, number of seeds per pod, seed weight, seed weight per plant in legumes while in cereals the parameters studied were root/ shoot length, its fresh and dry weights, number of spikelets per plant, its fresh and dry weights, number of grains per spikelet, grain weight and grain weight per plant. Observations were analysed
statistically. The result of all these studies are given in tables 16 to 19 and figures 22 to 25.

5.1 CEREALS:

5.1.1 Triticum aestivum:

Table 16 and figure 22 show the growth characteristics in *Triticum aestivum* cv. SFW-75 grown in soil irrigated with 25% and 50% polluted river water concentration. Result reveals that polluted river water is promotory at lower concentration while inhibitory at higher concentration. Thus plant growth and yield are promoted in 25% polluted water concentration and inhibited in 50% effluent concentration. On 30\textsuperscript{th} day, in 25% polluted water length, fresh and dry weights of root per plant are ca. 165.9%, 109.9% and 138.3% respectively over the control, while on 60\textsuperscript{th} day in the same concentration, these values are ca. 151.9%, 120.4% and 117.8% respectively of the control. In the similar manner in 50% polluted water the root length, its fresh and dry weights per plant are ca. 81.1%, 88.3% and 86.6% of control on 30\textsuperscript{th} day, while these parameters are ca. 76.6%, 90.1% and 80.1% respectively of the control on 60\textsuperscript{th} day.

Likewise in 25% polluted water concentration, the length, fresh and dry weights of shoot per plant are ca. 120.7%, 120.3% and 126.5% of the control on 30\textsuperscript{th} day while on 60\textsuperscript{th} day these values are ca. 123.5%, 135.5% and 141.9% of the control respectively. Similarly in 50% polluted water concentration shoot length, its fresh and dry weights are ca. 79.2%, 86.0%
and 87.1% of the control on the 30\textsuperscript{th} day and 81.4%, 86.6% and 58.8% of the control on the 60\textsuperscript{th} day respectively.

Table 16 also indicates that the result of vegetative growth is accompanied by increase and decrease in the yield pattern on 90\textsuperscript{th} day of emergence. In 25% polluted water irrigated plants, spikelet number per plant, its fresh and dry weights, grain number per spikelet and grain weight per plant are ca. 119.2%, 134.8%, 126.6%, 199.5% and 137.9% of the control while in 50% polluted water irrigated plants these values are ca. 84.2%, 91.5%, 75.5%, 87.8% and 81.7% of the control respectively. Thus results indicated that irrigation with 25% polluted river water proved to be promotory for the growth and yield of the plant, while 50% polluted river water inhibited the growth and yield as compared to that of control.

5.1.2 \textit{Oryza sativa}:

Table 17 and figure 23 show the growth characteristics and yield of \textit{Oryza sativa} cv. PR-14 grown in soil, irrigated with 25% and 50% concentration of polluted river water as compared to control. Results show that 25% polluted river water promotory whereas 50% polluted river water is deleterious for growth and yield of \textit{Oryza sativa}. Thus on 30\textsuperscript{th} day in 25% polluted river water length, fresh and dry weights of root are ca. 124.12%, 116.9% and 99.2% while in 50% polluted river water these parameters are ca. 89.2%, 88.8%, 66.3% of the control respectively. Further on 60\textsuperscript{th} day root length, fresh
and dry weights are ca. 109.6%, 127.5%, 113.8% in 25% polluted river water whereas in 50% polluted river water these parameters are ca. 91.6%, 76.5%, 90.6% of the control respectively.

Similarly in 25% polluted river water length, fresh and dry weights of shoot are ca. 108.6%, 109.2 and 139.0% on 30\textsuperscript{th} dry and 105.6%, 114.4% and 127.5% of the control on 60\textsuperscript{th} day. In 50% polluted river water shoot length, fresh and dry weights are ca. 91.7%, 89.7% and 88.6% of the control respectively on the 30\textsuperscript{th} day and on 60\textsuperscript{th} day these values are ca. 93.2%, 82.5% and 74.3% of the control respectively.

Result also indicates that yield in general is promoted with 25% and inhibited with 50% polluted river water application. Thus in 25% polluted river water spikelet number per plant, are ca. 128.5%, 109.9%, 126.9%, 105.0% and 147.2% of the control respectively while these values are ca. 69.0%, 91.7%, 91.4%, 91.2% and 82.4% of the control in 50% polluted river water.

\section*{5.2 LEGUMES :}

\subsection*{5.2.1 Vicia faba :}

Table 18 and figure 24 show the growth characteristics and yield of \textit{Vicia faba} cv. Desi grown with 25% and 50% irrigation as compared to control. Result shows that lower 25% polluted river water causes general promotion and higher 50% concentration causes general inhibition of plant growth and yield. Thus in presence of 25% polluted river water length, fresh
and dry weights of root per plant are ca. 126.1%, 98.6% and 112.5% of the control at 30\textsuperscript{th} day and 115.4%, 106.5% and 114.4% of the control at 60\textsuperscript{th} day of emergence. Similarly with 50% polluted river water irrigation, length, fresh and dry weights of root are ca. 92.3%, 79.1% and 92.5% of the control at 30\textsuperscript{th} day and 87.8%, 87.2% and 84.0% of the control respectively at 60\textsuperscript{th} day of emergence.

The effect of polluted river water on nodulation was also recorded since in legumes productivity depends upon nodulation. Table 18 and figure 24 higher concentration suppresses the nodulation. Thus in 25% polluted river water fresh and dry weights of nodules per plant are ca. 115.8%, 116.6% and 121.8% of the control on 30\textsuperscript{th} day while on 60\textsuperscript{th} day these values are ca. 109.9%, 100.8% and 106.6% of the control respectively. Similarly in 50% polluted river water the number, fresh and dry weights of nodules are ca. 77.4%, 82.0% and 68.7% of the control at 30\textsuperscript{th} day and 82.3%, 73.6% and 80.0% of the control at 60\textsuperscript{th} day respectively.

Likewise, length, fresh and dry weights of shoot are ca. 136.0%, 120.9% and 118.2% of the control in 25% polluted river water on 30\textsuperscript{th} day and 127.0% 115.7% and 108.0% of the control in the same concentration on 60\textsuperscript{th} day. Similarly in 50% concentration length, fresh and dry weights of shoot on 30\textsuperscript{th} day are ca. 74.7%, 86.2% and 81.7% of the control while on 60\textsuperscript{th} day the values of these parameter in the same concentration are ca. 79.4%, 91.2% and 92.8% of the control respectively.
Table 18 further shows that these results of vegetative growth are also accompanied by increase of decrease in the yield in 25% and 50% concentrations of polluted river water. Thus in 25% polluted river water number of pod, weight of pod, number of seed per pod and seed weight per plant are ca. 123.0%, 115.4%, 120.3% and 115.1% of the control respectively while in 50% concentration, the values of these parameters are ca. 80.6%, 93.3, 86.8% and 72.5% of the control respectively.

5.2.2 Vigna Mungo:

Table 19 and figure 25 indicate that general growth declines in higher concentration of polluted river water viz. 25% and 50% on the growth and yield of *Vigna mungo* cv. ND-40.

Table 19 and Figure 25 indicate that general growth declines in higher concentration of polluted river water and increases in lower concentration of the same as compared to control. Result thus shows, that in general there is promotion in all the growth parameters grown in 25% polluted river water, while in 50% concentration, these parameters show an inhibition. In 25% polluted water, length, fresh and dry weights of root are ca. 104.7%, 112.6% and 108.0% of the control on 20\textsuperscript{th} day of emergence and 118.3%, 106.1% and 112.5% of control on 40\textsuperscript{th} day respectively. Similarly, length, fresh and dry weights of shoot in 25% polluted water on 20\textsuperscript{th} day are ca. 104.7%, 106.9% and 140.3% and 111.8%, 102.0% and 192.5% on 40\textsuperscript{th} day of emergence as compared to control. Likewise in 50% polluted water length, its fresh and dry weights on 20\textsuperscript{th} day are ca. 91.7%, 94.5% and 91.8% of the control and the values
of these parameters are ca. 80.8%, 85.7% and 97.2% of the control further in the same concentration on 20\textsuperscript{th} day shoot length, its fresh and dry weight are ca. 93.1%, 85.2% and 74.6% of the control on 40\textsuperscript{th} day.

As nodulation is the part of productivity in legumes, thus the effects of different concentrations of polluted river water were also studied. Like other plant parts, nodules also show promotion in number in lower concentration of polluted river water and inhibition in higher concentration. Thus 25\% polluted water 20\textsuperscript{th} day, number of nodules, its fresh and dry weights are ca. 123.5%, 105.8% and 129.1% of the control and 110.7%, 107.1% and 120.4% of the control respectively on 40\textsuperscript{th} day in 25\% polluted water. Similarly in 50\% polluted water nodule number, its fresh and dry weights are ca. 88.2%, 73.5% and 91.6% of the control on 20\textsuperscript{th} day and on 40\textsuperscript{th} day these parameters are ca. 82.1\%, 89.2\% and 17.7\% of the control in the same concentration.

Table 19 and figure 25 also show the effect of polluted river water different concentration on the total yield which indicates the promotion and inhibition in lower and higher concentration of polluted water respectively. Thus is 25\% polluted water pod number, weight, length, seed number per pod and seed weight per plant are ca. 134.9\%, 126.4\%, 153.0\% and 120.8\%, while in 50\% polluted water value of these parameters are ca. 74.5\%, 81.7\%, 83.6\% and 90.3\% of the control respectively.