Yield Variation in Mustard Crop Due To Sewage Irrigation

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ABSTRACT-

A higher total yield was recorded from sewage irrigated field than the control field. The increase in infection on pods correspondingly decreased with its progress of the pod length, number of seeds per pod, 1000 seed weight and the percent oil contents of the seeds. The diseases were also responsible for loses in yield production. Both the fields showed only two diseases of fungal pathogens i.e. Alternaria blight and white rust of mustard. Both the diseases were found to cause a great loss in total production of the crop. The correlation coefficient was negatively significant, showing inverse association of two characters indicating that increase in per cent incidence of disease the yield decreased. Leaf and pod infection also represented a negative correlation with the seed yield. The regression study revealed that due to one per cent leaf infection the yield decreased 24.56 Kg per hectare. The losses in yield were estimated upto 74.92 per cent with 46.06 per cent disease incidence in tubewell irrigated field and 70.52 per cent with 43.86 per cent disease in sewage irrigated field. A highly significant variation in per cent disease index due to crop growth stages and due to field types was proved statistically. An assessment of yield loss by comparative determination revealed that with the increase of infection on pods, the pod length, number of seeds per pod, seed weight and oil per cent decreased progressively and the number of infected seeds increased with the increase on infection. In comparison to healthy seeds taken from healthy pods from sewage irrigated field, the seeds taken from diseased pods showed 16.16 percent loss in oil content. From tube well irrigated fields also 14.22 per cent loss in oil content was estimated from diseased pods. Due to infection the seed weight was also reduced upto 9.97 per cent in sewage irrigated and 11.27 per cent in tube well irrigated field. The diseases not only reduced the seed output and pod length but also reduced the total oil contents of the seeds.

Keywords: Sewage, Yield, Disease, Mustard

I INTRODUCTION

Sewage can be utilized as a source of fertilizer to the agrochemical fields. It provides water and nutrients and has potentiality in terms of nutrients for the plants especially for N, P, and K enrichment which regulate the plant growth. Sewage irrigation for agriculture purpose has a lot of implications and serious threat to soil agroecosystem. Sewage irrigation is also responsible altering the physico-chemical characteristics of the soil, influencing soil microflora leading to severe plant and animal diseases and in turn affecting yield of the crop qualitatively and quantitatively both (Vimal and Talashikar, 1983; Giusquiani *et al.*, 1992) Asano (1994) viewed that waste water reuse as an alternative and reliable water resourse against the specter of growing demands of water. Soil microflora has the direct markable effect on plant growth regulating substances. Abdel-Mallek *et al.* (1988) and Chitra and Vittal (1989) has found a significant increase in fungal population of soil treated with sewage sludge. Gangawane and Kulkarni (1985) recorded rhizosphere microflora is altered with sewage sludge treatment and opined that the change was due to direct effect of present constituents of sewage or indirectly due to changes in the root exudates pattern of plants. Lewis *et al.* (1981) observed that the treatment of sewage sludge compost to the soil will be appreciable to decrease the activity of certain diseases.

II MATERIALS AND METHODS

(a) Selection of crop and sites for experimental study: To evaluate the effect of sewage irrigation on disease development with consequent loss, two fields were selected for studies which were situated at Jaderuwa Dam near Morar in Gwalior. One selected field was irrigated with sewage water (treated field) and the other neighbouring field was irrigated with tubewell water (control field). Mustard crop was selected for the present study, because in this particular area in more than seventy per cent fields only mustard crop is grown in Rabi season. This crop is also economically important for this particular area. The Chambal Division which includes Gwalior, Bhind and Morena distrists are well known as "Mustard growing zone" of Madhya Pradesh. Hence, the area is reach for the production of mustard.

(b) Per cent Incidence of Disease: A Survey of crop for mustard diseases was conducted at four stages of crop growth to compute per cent incidence of disease by using quadrate method.

Percent incidence of disease= number of diseased plants in one meter square area/Total number of plants present in one meter square area*100

Four stages of Crop growth taken in account are as follows:

1. Pre-flowering stage
2. Flowering Stage
3. Podding stage

4. Harvesting stage

(C) Crop loss estimation: Yield loss was estimated in the field by taking different parameters in consideration. Average loss of yield per plant and loss of seed weight was recorded to find out per cent loss of yield. Loss in oil content was recorded by ether extraction method using Soxhlet's apparatus (Iswaran, 1980).

Correlation coefficient between percentage infection and yield regression equation was also worked out.

Regression equation (y) = 1510-24.56x
Where y = Yield after loss in Kg/Hectare
1510 = Kg normal yield of mustard/Hectare
24.56 = Kg/Hectare loss at 1 per cent infection
X=per cent infection

Table: 1 Per cent incidence of disease on mustard crop at various growth intervals and consequently yield after loss.

Stages of crop growth	Per cent disease		Yield after loss Kg/H (Regression Equation =Y)	
	Sewage Irrigated	Tubewell Irrigated	Sewage Irrigated	Tubewell Irrigated
Pre flowering stage	1.55	2.08	1471.94	1458.92
Flowering stage	12.44	13.90	1204.37	1168.62
Podding stage	34.85	38.32	654.08	568.86
Harvesting stage	43.86	46.06	455.08	338.77

C.D. at 5% level
Field A X Field B = 0.744 H.S
Between seasons = 1.051 H.S
Field Type X Seasons = 1.487 H.S

Table : 2 Assessment of yield loss per plant in sewage irrigated and tubewell irrigated fields.

Type of Field	Yield per plant (g)		Yield loss per plant (Per cent)
	Healthy	Diseased	
Sewage Irrigated	15.45	8.58	44.66
Tubewell Irrigated	15.02	7.46	50.33

Table : 3 Assessment of yield loss due to diseases in mustard crop

Category of infection on pods	Pod length (cm)		No. of seeds/pod		No. of infected seeds/pod		1000 seed weight		Per cent oil content	
	Sewage Irrigated	Tubewell Irrigated	Sewage Irrigated	Tubewell Irrigated	Sewage Irrigated	Tubewell Irrigated	Sewage Irrigated	Tubewell Irrigated	Sewage Irrigated	Tubewell Irrigated
Healthy Pods	7.60	7.40	19.00	19.00	2.0[illegible]	0.00	8.26	8.16	46.40	44.8[illegible]
Superficial Lesions/pod	7.40	7.60	19.00	16.00	2.0[illegible]	0.00	8.10	8.06	46.40	43.2[illegible]
1-2 deep Lesions/pod	7.60	7.50	16.00	12.00	1.72	1.86	8.03	7.8[illegible]	46.50	42.8[illegible]
3-5 deep Lesions/pod	7.30	7.[illegible]0	12.00	16.00	2.8[illegible]	2.73	7.65	7.60	41.30	41.8[illegible]
More than 5 Lesions/pod	7.[illegible]0	6.90	14.00	17.00	4.23	4.93	7.40	7.20	39.30	38.0[illegible]

III DISCUSSION

The increase in yield of mustard crop in sewage field in comparison to tubewell irrigated field may be due to lower incidence of disease and/or due to application of sewage water to the field which in turn improve the physico-chemical characteristics of soil and make available the nutrients to growing plants. Allievi *et al*., (1993) concluded that the use of compost can lead to improve soil fertility, even after several years, which in turn results both in quantitative as well as in qualitative improvement in yield. Bevaqua & Mellano (1993) also reported the benefits in yields from compost application. Certain studies are available (Vimal and Talashikar, 1983 & Giusquiani *et al.* 1992) which point out towards the utility of wastes for crops as fertilizers and for their certain agronomic reasons

Chahal and Kang (1978) & Kaushik *et al*. (1984) reported shriveling of seeds and reduction in quantity of oil content to be the major effect due to severe infections of diseases. A correlation of disease intensity on foliage and/or silique with components of yield losses of rapeseed mustard has been estimated and interpreted by Saharan (1991). Ansari *et al*. (1985) reported the loss of oil content of seeds from diseased plants of rapeseed over the seeds from healthy plants to be ranging between 14.6 to 30 per cent . Saharan (1992) has also reported 10-78 per cent loss from oil yielding crops due to Altennaria blight in India. Reduction in pod length, number of seeds per pod, seed weight and per cent oil contents due to infection on pods have been assessed during present study and

showed negative correlation with the infection category on pods. Increase of deep lesions on silique increased the percentage of seed infection and decreased pod length, seeds per pod, seed weight and per cent oil content which has also been reported by many workers (Bandhyopadhyay *et al*., 1974; Chahal and Kang 1979; Kolte *et al*. 1987).

Narwal *et al*. (1983) found that application of sewage sludge despite adequate nutrient supply also the dry matter of fodder rape as compared with soil without sludge was increased. The wheat grain and straw increased when crop residue was applied (Dev and Bhardwaj, 1991). The grain yield of wheat and soyabean increased by the application of poultry or piggery manures and did not need any supplementary dose of fertilizer (Gupta *et al.* 1992). Cimino and Toscano (1993) found that the application of sludge provided good growth of pea and broad bean species, increased germination and better yield in comparison of use of inorganic fertilizer. Bevaqua and Melano, (1993) observed that the application of compost favoured early stand development and for onion, turf and spinach were upto 5 per cent level and snapdragon yield were also increased . Allievi et al. (1993) reported that use compost have a constant improvement in both quantity and quantity of production.

Application of sewage sludge is beneficial and it supplies nutritional agents to the soil and ultimately leads in improvement of production. However, phytotoxic levels of heavy metals could be enhanced by sludge application and therefore, this is problematic and ultimately is concerned with human health. Toxic effects due to high concentration of manganese by sewage application have also been observed by Chapman (1978) and Gupta and Macleod (1973).

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