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Effect of Chlor-Alkali Solid Waste Effluent on Productive Panicle Length and Productive Tiller Number of A Little Millet Crop

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Abstract

The little millet (*Panicum sumatrense* Rath ex. Roem and Schult) crop variety SS. 81-1, exposed to chlor-alkali solid waste effluent @ 100 g m^{-2} (treatment - 1),200 g m^{-2} (treatment - 2), 300 g m^{-2} (treatment - 3) and 400 g m^{-2} (treatment - 4) was studied in vivo at the Agriculture Research Station, Ankuspur in the District of Ganjam, Odisha at an interval of 15 days starting from 30 days after sowing (DAS) till harvest of the crop following the ICAR technology proposed by Seetharam (1994) with little modification depending upon the soil condition and climate of the locality. Harvesting data (i.e. on 87 days after showing) was considered for enumeration of productive panicle length and number of productive tiller. The length of productive panicle (cm) gradually increased from control to treatment-1, treatment-2 and then to treatment-3. Treatment-4 showed lower panicle length compared to treatment-3. The average number of productive tiller exhibited almost same in control and all treatments at the time of harvest (87DAS) of the crop. Variance analysis pertaining to length of productive panicle showed significant F values ($p \leq 0.05$) whereas no significant variation was observed in case of number of productive tillers among the control and treatments exposed to various concentration of chlor-alkali solid waste effluent.

Keywords: Chlor-Alkali Factory, Solid Waste Effluent, Little Millet, Productive Tiller, Panicle.

Introduction

Millet in general is the staple food of tribals and also of the labour class in the eastern part of the state of Odisha. The crop withstands heavy rain and also drought condition to a considerable extent. *Panicum sumatrense* formerly known as *Panicum miliari* is one of the typical minor millet crop grown widely on the hill tops, hill slopes and also in the hill bases. Recently cultivation of this crop has also been taken up in the plains. Compared to other small millet *Panicum sumatrense* has some unusual features. It has the capacity to withstand drought and water logging to a considerable extent. It does not need crop protection measures. Basically, it is free from pest. It does not require either irrigation or fertilizer and pesticide. Simply, the tribals broadcast the seed by hand with the onset of first rain and harvest after 85-90 days.

Review of Literature

The degradation of environment due to industrial waste threatens the survival of living beings. Literature available revealed mostly the adverse effect of chlor-alkali solid waste on algae (Mishra **et al**. 1985, 1986), on fish (Shaw **et al.** 1985) and on rice (Nanda **et al.** 1993, 1994, 1996, Behera **et al.** 1995). So far as the little millet crop is concerned, some work has been done by Indian Council of Agricultural Research (ICAR, 1992-93, 1993-94, 1994-95, 1995-96 and 1996-97) under All India Coordinated Small Millet Improvement Project associated with various cooperative agencies for the development of crop productivity. Most of this investigation is confined to fodder and grain yield. However, no work has been done on the effect of chlor-alkali solid waste effluent on productive panicle length and productive tiller number of little millet crop.

Aim of the Study

The aim of this investigation is to find out the effect of chlor-alkali factory solid waste effluent on the productive panicle length and productive tiller number of a little millet crop with a view to waste management in Agriculture.

Study Site and Environment

The experiment was conducted at the Agriculture Research Station (a Research farm of Orissa University of Agriculture and Technology, Bhubanswar, Odisha), Ankuspur (l9°46'N; 94°21'E) situated at a distance of about 25 km from the Bay of Bengal Coast, Odisha.

The climate of the experimental site was monsoonal with three distinct seasons i.e. rainy (July to October), winter (November to February) and summer (March to June). Out of 863.65mm of rain recorded during the experimental year, a maximum of 28.8 per cent was observed in June. The mean minimum and mean maximum atmospheric temperature recorded during the year were found to be normal. The mean minimum temperature ranged from 15.4°C (December) to 26.13°C (May) whereas mean maximum showed a range of 27.6°C (December) to 37.81 °C (May).

The soil was found to be sandy (75%) and acidic (pH = 6.58) in nature. The phosphorus and potassium contents of the soil were high (i.e., 9.0 and 46.6 ppm respectively) whereas the amount of organic carbon (%) was very low (0.35%). The solid waste of chlor-alkali factory (M/s. Jayashree Chemicals) applied in the field soil was found to be alkaline (pH=8.06). Textural analysis showed almost nil of sand, silt and clay. The waste soil exhibited a medium range of phosphorus and potassium contents. The organic carbon (%) of the waste was of very low order (Barik, 2016)

Materials and Methods

Twenty-five beds were prepared following the usual agricultural practice. Solid waste collected from the chlor-alkali factory was applied at the concentration of 100 g m^{-2}, 200 g m^{-2}, 300 g m^{-2} and 400 g $m^{-2}$and marked as treatment -1, 2, 3 and 4 respectively. The soil was mixed thoroughly in each bed and leveled. Five beds for each concentration and control were maintained. ICAR technology proposed by Seetharam (1994) was employed for cropping with little modification depending upon the soil condition and climate of the locality. The sampling was made at an interval of 15 days starting with a 30 days period after sowing till the harvest of the crop. For the determination of productive panicle length and productive tiller number, data were collected on the day before the crop was harvested i.e. on 87 days after sowing. Five plants were selected randomly from control and each treatment.The productive tillers were counted and panicle lengths were measured in cm and averaged. Collected data were analysed statistically following Misra and Misra (1983) to draw a conclusion on the effect of chlor-alkali solid waste effluent on productive panicle length and productive tiller number of a little millet crop.

Results and Discussion

The number of productive tiller in control and various treatments are presented in Fig.-1. The average number of productive tiller exhibited almost same in control and all treatments exposed to various concentration of chlor-alkali solid waste effluent. The productive panicle length gradually increased from control to treatment-1, treatment-2 and then to treatment-3. The plants in treatment-4 showed lower panicle length compared to treanment-3 (Fig.-2).

Analysis of variance test pertaining to length of productive panicle showed significant F value (p ≤ 0.05) whereas no significant variation was observed in case of number of productive tiller among the control and treatments. This reveals that the concentration of solid waste effluent applied in the field soil had no effect on the number of productive tiller. On the other hand the waste soil concentration applied in the soil might be the reason for the variation in the productive panicle length as evidence from variance test (Table-1).

Fig. 1

Number of Productive Tiller at 87 Days After Sowing (Mean ± SD)

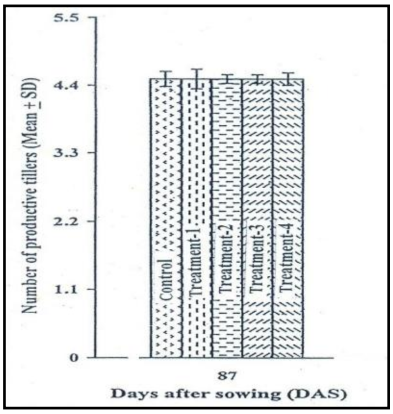

Fig. 2

Length of Productive Panicle in cm at 87 days After Sowing (Mean ± SD)

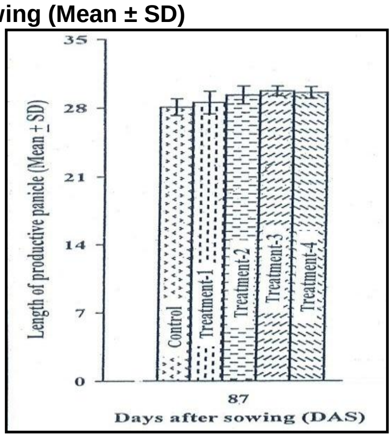

Table 1

Variance Ratio Test on the Productive Tiller Number and Panicle Length of Little Millet Crop in Control and Four Treatments at Harvest i.e. on 87th Day After Sowing (n=25).

Days After Sowing (DAS)	Productive Tiller Number	Productive Panicle Length (cm)
87 DAS	F=0.000 NS	F=3.543* LSD=1.14

* ≤ 0.05p, NS=Not Significant, LSD=Least Significant Difference (p=0.05).

The number of productive tiller of little millet (local variety) in various climatic regions reported by ICAR (1996-97) when compared with the present findings, showed that the number of productive tiller was high in the state of Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh (except Dindori) and Tamil Nadu and low in Bihar. Dindori in the state of Madhya Pradesh showed less number of productive tiller compared to present findings (Table-2). This variation in number of productive tiller from place to place is probably due to climatic fluctuation, variety used, genetic set up of the crop, date of sowing of the crop and soil quality of the locality.

Table-2

Productive Tiller Number of Little Millet (Local Variety) at Various Climatic Regions.

Sources	State (s)	Location(s)	Productive Tiller Number
ICAR (1996-97)	Andhra Pradesh	Pandirimamidi Rasthakuntabai	8.4 6.7
	Bihar	Kanke	2.6
	Gujurat	Dahod Waghai	7.7 8.2
	Karnataka	Hanumanamatti	8.4
	Madhya Pradesh	Dindori Jagadalpur Rewa	4.0 4.6 4.6
	Orissa	Berhampur	4.5
	Tamil Nadu	Coimbatore	7.0
This Study	Orissa	Berhampur- Control Treatment-1 Treatment-2 Treatment-3 Treatment-4	 4.5 4.5 4.5 4.5 4.5

Conclusion

The concentration of solid waste effluent applied in the field soil has no effect on the number of productive panicle of little millet crop. The productive panicle length on the other hand gradually increased from control to treatment-1, treatment-2 and then to treatment-3. Treatment-4 plants showed lower panicle length compared to treanment-3. This indicates that the chlor-alkali solid waste effluent applied in treatment-4 might be higher than the tolerance limit of the crop as a result variation in effective panicle length was observed among the control and treatments exposed to various concentration of chlor-alkali solid waste effluent applied in the field soil. The soil characteristics, precipitation, atmospheric temperature, relative humidity etc. might be responsible for detoxification of waste soil concentration applied in the soil.

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References

1. Barik, K.L. (2016), Effect of chlor-alkali solid waste effluent on the fodder and grain yield of a little millet crop. The Global J. Environ. Sci. and Research, 3 (1), 85-88.
2. Behera, M., Padhy, B. and Patra, B. (l995), Effect of industrial effluent on seed germination and seedling growth of rice (*Oryza sativa* L). Neo Botanica, 3 (1&2),7-12.
3. ICAR (1992-93), All India coordinated small millet improvement project. Annual Report, Indian Council of Agricultural Research and Cooperating Agencies, Bangalore.
4. ICAR (1993-94), All India coordinated small millet improvement project. Annual Report, Indian Council of Agricultural Research and Cooperating Agencies, Bangalore.
5. ICAR (1994-95), All India coordinated small millet improvement project. Annual Report, Indian Council of Agricultural Research and Cooperating Agencies, Bangalore.
6. ICAR (1995-96), All India coordinated small millet improvement project. Annual Report, Indian Council of Agricultural Research and Cooperating Agencies, Bangalore.
7. ICAR (1996-97), All India coordinated small millet improvement project. Annual Report, Indian Council of Agricultural Research and Cooperating Agencies, Bangalore.
8. Mishra, B.B., Nanda, D.R. and Misra, B.N. (1985), Reclamation with blue-green algae; Mercury uptake by algae cultured in solid waste of a chIor-alkali factory and its effect on growth and pigmentation. J. Environ. Biol., 6 (4), 223-231.
9. Mishra, B.B., Nanda, D.R. and Misra, B.N. (1986), Reclamation with blue-green algae; Changes in free amino acid content of algae

exposed to solid waste of a Chlor - alkali factory. Microb. Lett., 33, 139-142.

10. Nanda, D.R., Mishra, B.B. and Misra, B.N. (1993), Effect of solid waste from a Chlor-alkali factory on rice plants; Mercury accumulation and changes in biochemical variables. J. Environ. Studies, 45,23-28.
11. Nanda, D.R., Mishra, B.B. and Misra, B.N. (1994), Changes in bio- chemical variables of a Crop plant exposed to saturated solid waste extract from a Chlor-alkaJi factory. Mendel, 11 (3 & 4), 151-152.
12. Nunda, D.R., Mishra, B.B. and Misra, B.N. (1996), Effect of solid waste from a Chlor-alkali factory on accumulation of mercury and changes in biomass of rice roots. Oryza., 33, 51-54.
13. Seetharam, A (1994), Technology for increasing finger millet and other small millets production in India, Project Coordination Cell, All India Coordinated Small Millet Improvement Project, Indian Council of Agricultural Research, GKVK Campus, Bangalore.
14. Shaw, B.P., Sahu, A, and Panigrahi, A.K. (1985), Residual mercury concentration in brain, liver and muscle of contaminated fish collected from an estuary near a caustic-chlorine industry. Curr. Sci., 54 (16), 810-812.