

Influence of Water Hyacinth and Fertilizer Levels on Growth and Yield of Hybrid Sorghum (*Sorghum bicolor* (L.) Moench) I. Yield Components, Yield, Fertilizer Substitution and Economics

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Abstract : Effects of four levels each of water-hyacinth and fertilizer were studied on sorghum hybrid CSH-5 at the Agricultural College farm, Dharwad, during kharif 1986. Water-hyacinth at nine tonnes per hectare gave 6.4, 10.8 and 16.3 per cent higher grain and 8.2, 7.3 and 14.8 per cent higher stover yield than that of water-hyacinth at six, three and zero tonnes per hectare, respectively. Water-hyacinth at nine tonnes per hectare resulted in saving of 32.5 per cent of recommended fertilizer dose, valued at Rs. 331.89. Net profit was higher under nine tonnes water-hyacinth per hectare plus recommended fertilizer dose. Return per rupee spent was higher under nine tonnes water-hyacinth per hectare.

Introduction

Water-hyacinth (*Eichhornia crassipes* (Mart.) Solms.) is a free floating aquatic weed causing enormous losses and inconveniences in navigation, fishery, drainage, irrigation, water sports etc. The multitude potentials of this weed pose serious problems in controlling its spread. One way to control water-hyacinth is to exploit its economic potentialities so that its eradication would entail some economic returns. Among manifold uses of this weed, its use in agriculture as an organic manure is gaining much importance by virtue of its relatively high nutrient content (1.96 per cent N, 0.87 per cent P₂O₅ and 3.10 per cent K₂O dry weight basis) as analysed in the present

investigation, fast growth rate (800 kg dry matter per ha in a day) and narrow C : N ratio of 23 : 1. Since, the review of work done and paper published on water-hyacinth manuring in different crops such as rice, wheat and potato (Dhar, 1977), groundnut (Kumaresan *et al.*, 1984) and chilli (Maurya and Dhar, 1980) were very much encouraging, the present study was taken up to exploit the potential manurial value of water-hyacinth.

Material and Methods

A field experiment was carried out on black clay loam soil at the Agricultural College Farm, Dharwad, during kharif 1986 to study the in-

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fluence of water-hyacinth and fertilizer levels on growth and yield of hybrid sorghum, CSH-5, under rainfed conditions. The experiment consisted of 16 treatment combinations comprising four levels of water-hyacinth (0, 3, 6 and 9 tonnes per ha) and four levels of fertilizer (0, 25, 50 and 100 per cent of recommended dose of 100:75:37.5 kg N, P_2O_5 and K_2O per ha). Factorial experiment was laid out in RBD with three replications. The soil from experimental site was medium in total nitrogen and high in available phosphorus and potassium.

Compost from water-hyacinth was prepared by the pit method as given by Yawalkar *et al.* (1967). The compost was incorporated in the soil alongwith basal fertilizer doses of 50 per cent N and full dose of P_2O_5 and K_2O in bands by the side of seed rows as per the treatments. Remaining 50 per cent N was top dressed in bands after 30 days of sowing. Certified seeds of sorghum hybrid (CSH-5) were dibbled on June 25, 1986 in 45 cm apart lines about 5 cm deep and spacing of 10 cm was maintained between the plants in a row. The crop was harvested after full maturity and the observations on yield and yield components were recorded. Fertilizer substitution and economics of manuring were calculated.

Results and Discussion

Influence of water-hyacinth

The grain yield significantly differed from 31.77 q in control to 36.96 q in treatment of nine tonnes water-hyacinth per ha (Table 1). Water-hyacinth at nine tonnes per hectare gave 6.4, 10.8 and 16.3 per cent increased grain yield than that of six tonnes, three tonnes and zero level water-hyacinth per hectare, respectively. These results agree with the findings of Maurya and Dhar (1980), Kondap *et al.* (1981) and Kumaresan *et al.* (1984), who reported increased yields of chillies, rice and groundnut, respectively with the application of water-hyacinth.

The increase in grain yield with the application of water-hyacinth can be attributed to the favourable effect on yield components. The grain weight per ear, 1000-grain weight (except under 3 t/ha) and grain number per ear were higher in manured treatments than in the control. All these components were found significantly higher grain weight per ear than that of control due to increase in grain number per ear and 1000-grain weight.

Influence of fertilizers

Successive increase in the fertilizer levels from control to the recommended dose resulted in significant increase in grain yield. Application of recommended fertilizer dose (45.18 q/ha) gave 21.4, 44.7 and 94.4 per cent higher grain yield than the application of 50 per cent, 25 per cent and no fertilizer, respectively. These results are in conformity with the findings of Kudasomannavar (1980), Goudreddy (1982) and Pavate (1982).

The increase in grain yield with the application of higher levels of fertilizer was due to higher grain weight per ear as a consequence of increased length and girth of ear, grain number per ear and the 1000-grain weight. All the yield components were higher in the treatment receiving recommended fertilizer dose and were lower in control.

The stover yield differed significantly due to both water-hyacinth and fertilizer levels. Water-hyacinth at nine tonnes per hectare gave 8.2, 7.3 and 14.8 per cent higher stover yield than the application of six, three and zero tonnes of water-hyacinth per hectare, respectively. Application of recommended fertilizer dose gave 19.0, 47.5 and 98.8 per cent higher stover yield over the application of 50 per cent, 25 per cent and no fertilizer, respectively. The difference in the total dry matter production was attributed to the differences in stover yield (Kudasomannavar, 1980; Goudreddy, 1982 and Pavate, 1982).

Table 1. Yield and yield components of sorghum at harvest as influenced by water-hyacinth and fertilizer levels.

Treatments	Length of ear (cm)	Girth of ear (cm)	Grain weight per ear	100 - grain weight (g)	Grain number per ear	Grain yield (q/ha)	Stover yield (t/ha)
Water-hyacinth levels (W) (tonnes/ha)							
0	17.7	5.0	23.58	22.94	1020.00	31.77	55.72
3	18.0	5.1	24.50	22.90	1062.00	33.35	59.62
6	18.0	5.1	24.76	23.89	1028.00	34.75	59.11
9	18.1	5.2	25.68	24.32	1047.00	36.96	63.95
S.E.m. \pm	0.2	0.2	0.16	0.31	7.30	1.24	2.77
C.D. at 5%	NS	NS	0.48	0.90	21.09	3.58	8.00
Fertilizer levels (F) (% of recommended dose)							
0	15.5	4.1	18.56	20.96	896.00	23.24	39.69
25	17.5	4.7	22.95	23.17	990.00	31.21	53.51
50	18.4	5.3	26.85	24.79	1083.00	37.20	66.28
100	20.4	6.3	30.16	25.14	1199.00	45.18	78.91
S.E.m. \pm	0.2	0.2	0.16	0.31	7.30	1.24	2.77
C.D. at 5%	0.7	0.7	0.46	0.90	21.09	3.58	8.00
W x F:							
S.E.m. \pm	0.5	0.4	0.32	0.62	14.61	2.48	5.54
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS

NS - Non significant.

Fertilizer substitution by water-hyacinth manure

From the Fig.1, it is apparent that the grain yield obtained with the addition of recommended fertilizer dose (41.85 q/ha) was comparable to the yield obtained with the application of nine tonnes of water-hyacinth per hectare and 67.5 per cent of recommended fertilizer dose. Hence, a saving of 32.5 per cent of recommended fertilizer dose amounting to 32.5, 24.38 and 12.19 kg N, P₂O₅ and K₂O per hectare, respectively, was possible, valued at Rs. 331.89 per hectare.

Net return (Rs/ha) and return per rupee spent

The net profit per hectare increased with the application of increasing levels of both water-hyacinth and fertilizer (Table 2). The additional net profit per hectare over the control with the application of three, six and nine tonnes of water-hyacinth per hectare were Rs. 270.44 (19.00 per cent), Rs. 390.52 (27.45 per cent) and Rs. 757.03 (53.20 per cent), respectively. The addition of water-hyacinth manure at nine tonnes per hectare was found beneficial in getting higher net returns (Rs. 2179.95) as compared to other levels of

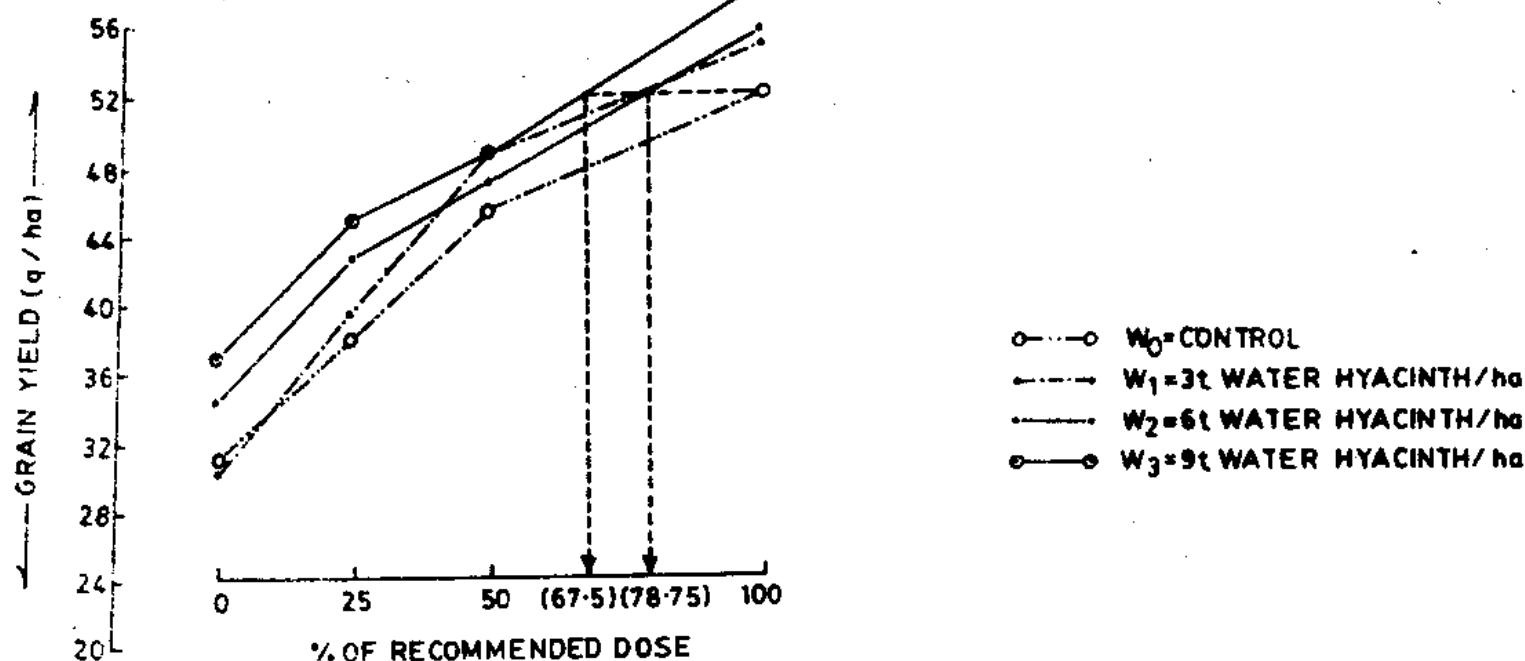


Fig-8-Fertilizer substitution by water-hyacinth manure.

water-hyacinth. The additional net profit was to the tune of Rs.1032.90 (263.55 per cent), Rs.1745.44 (445.36 per cent) and Rs.2763.64 (705.15 per cent) with the application of 25, 50 and 100 per cent of recommended fertilizer dose, respectively, as compared to the control. Maximum net profit per hectare (Rs.3667.47) was obtained under the treatment combination of nine tonnes water-hyacinth per hectare and recommended fertilizer dose as compared to other treatment combinations. However, the return per rupee spent was higher (Rs.4.45) under nine tonnes water-hyacinth per hectare as

compared to the sole or combined application of different levels of water-hyacinth and fertilizer.

These results indicate that under conditions of limited availability of capital resource, water-hyacinth manuring is beneficial to ensure effective utilization of limited capital for generating reasonable level of net profit per hectare. Contrary to this, under conditions of adequate availability of capital resource, combined application of higher levels of water-hyacinth and fertilizer was found beneficial for getting higher net returns per hectare.

Table 2. Net return (Rs./ha) and return per rupee spent from application of water-hyacinth (W) and fertilizer(F) levels.

Treatments	Net return (return per rupee spent)*				Mean
	0	25%F	50%F	100%F	
0 t/ha W	140.07 (-)	969.04 (2.90)	1929.95(2.98)	2652.60 (2.92)	1422.92
3 t/ha W	47.77 (-1.06)	1239.86 (3.18)	2321.47 (3.31)	3164.33 (3.19)	1693.36
6 t/ha W	492.27 (3.26)	1582.04 (3.56)	2041.63 (2.92)	3137.82 (3.09)	1813.44
9 t/ha W	887.56 (4.45)	1908.36 (3.84)	2256.40 (3.02)	3667.47 (3.36)	2179.95
Mean	391.92	1424.82	2137.36	3155.56	

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