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Effect of Weed Control on Performance of Guinea Grass-Legumes Intercropping System under Rainfed Conditions

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ABSTRACT: A field experiment was conducted during 2006-2011 on sandy loam soil at Central Research Farm of Indian Grassland and Fodder Research Institute, Jhansi to study the effect of weed control on performance of Guinea grass-legumes intercropping system under rainfed conditions. Intercropping of *Stylosanthes hamata* with Guinea grass produced significantly higher total dry forage (5.18 t/ha) than *Clitoria ternatea* (3.89 t/ha), *Macroptillium atropurpureum* (4.19 t/ha) and S. *seabrana* (4.67 t/ha) during 1st year of experiment. While during 2nd, 3rd and 4th years, intercropping of *Stylosanthes seabrana* with Guinea grass produced significantly higher total dry forage yield (9.56, 6.56 and 6.04 t/ha) than *Clitoria ternatea* (7.92, 5.23 and 4.49 t/ha), *Macroptillium atropurpureum* (8.12, 5.34 and 4.76 t/ha) and S. *hamata* (8.76, 5.97 and 5.26 t/ha). In total dry forage yields, per cent contribution of S. *seabrana* were 34.90, 31.17, 41.62 and 40.73 during 1st, 2nd, 3rd and 4th years respectively. Crude protein yields (812.3, 587.0 and 538.7 kg/ha) were also increased significantly when guinea grass intercropped with S. seabrana than intercropping with C. *ternatea, Macroptillium atropurpureum* and S. *hamata*. In weed management practices, hand weeding 35 days after sowing in 1st year and 25 days after onset of monsoon rain from 2nd year onwards recorded significantly higher dry forage yields of both Guinea grass (3.52, 7.81, 4.53 and 4.21 t/ha) and legumes (1.81, 2.48, 2.15 and 1.72 t/ha) than weedy check, pre-emergence application of pendimethalin @ 0.75 kg a.i./ha and weeding with weeder cum mulcher during 1st, 2nd, 3rd and 4th years, respectively. The Maximum net return (₹ 4232, 20778, 14532 and 15390/ha) and net return per rupee invested (₹ 0.38, 2.26, 1.64 and 1.63) were obtained by intercropping of Guinea grass with S. *seabrana* during 1st, 2nd, 3rd and 4th years of study. Hand weeding 35 days after sowing in 1st year and 25 days after onset of monsoon rain from 2nd year onwards also recorded maximum net return (₹ 3771, 17053, 9796 and 10183/ha) during all the 4 years.

Key words: Crude protein yield, economics, intercropping, weed control

One of the main reason for low productivity of animals is feeding of poor quality of forage. In this context establishment of legumes in association with grasses are important for improving the quality of forage (Thomas *et al.,* 1997). Legume also enriches the soil fertility and benefits the associated grasses. *Stylosanthes seabrana* is a perennial that is tolerant to drought and has the capacity to generate very rapidly from seed. It is tolerant to grazing and is probably more tolerant to soils with lower phosphorus status than C. *ternatea, Desmanthus* and Lablab. However, in intercropping with grasses, legumes generally performed poorly because of competition with grasses and faster growth of weeds and their smothering effect during early stage of legumes growth. Presence of weeds in pasture field generally reduce the forage quality on account of low crude protein content and dry matter digestibility and high fibre content and also reduce quality of livestock products and affects animal health (Singh, 1988). Moyer et al. (2003) reported that presence of weeds in forage crops fields reduce the protein yield than weed free plots. In such situations weed management practices can provide best opportunity to legumes to establish and grow vigorously upto the time of harvest for quality forage production. In view of these points, the present experiment was under taken to study the effect of weed control on performance of Guinea grass-legumes intercropping system under rainfed conditions.-+

Materials and Methods

A field experiment was conducted during 2006-2011 at Central Research Farm (25^0 27' N latitude, 78^0 37' E longitude and 275 m above mean sea level) of Indian Grassland and Fodder Research Institute, Jhansi to study the effect of weed control on performance of Guinea grass-legumes intercropping system under rainfed conditions. The soil of the experimental field was sandy loam, low in organic carbon (0.46 and 0.50) and available nitrogen (207.75 and 227.38 kg/ha) and medium in available phosphorus (10.20 and 10.70 kg/ha) and potash (149.36 and 163.30 kg/ha) in initial and last years, respectively. The total rainfall received was 553.8, 1267.1, 544.9 and 684.1 mm in 38, 52, 33 and 32 rainy days during 2007, 2008, 2009 and 2010 respectively. In 2007 an abnormal situation occurred for the subsequent five weeks (29-33 SMW-Standard meteorological weeks) in which a large rainfall deficiency in the range of 45.8 to 71.1% was observed. Also, ensuing weeks (35 and 37- 39 SMW) received below normal rainfall in the range of 25.1 to 37.8%. In 2008 the break in monsoon condition during 29, 35, 36 and 37th SMW occurred. In 2009 a dry spell of two weeks, i.e., 30 and 31st (23 July - 5 August) SMW occurred

and 32nd SMW received 11.6 mm of rainfall in one rainy day and thus the rainfall deficiency was 85.5% during this week. In 2010 a dry spell of one week i.e. 32nd (6-7 August) SMW occurred and 37th SMW received only 4.0 mm of rainfall causing a rainfall deficiency of 92% during this week.

There were 16 treatment combinations replicated thrice in randomized block design. The treatment comprised four legumes *(Stylosanthes hamata, S. seabrana, Clitoria ternatea and Macroptillium atropurpureum)* and four weed management practices (weedy check, hand weeding-35 days after sowing in first year and 25 days after onset of monsoon rain from 2nd year onwards, weeding with weeder cum mulcher-35 days after sowing in first year and 25 days after onset of monsoon rain from 2nd year onwards and pre-emergence application of pendimethalin @ 0.75 kg a.i/ ha in first year and just after one day of onset of monsoon rain from 2nd year onwards). The seedlings of Guinea grass were transplanted in the month of July 1 m apart and in between two rows of grasses legumes were sown. Dry matter content was estimated by drying 500 g plant sample of each treatment and replication in hot-air oven at 70^0C, which led to computation of dry matter yield. The crude protein content of the fresh samples was estimated by the procedure of AOAC (1995).

Results and Discussion

Growth parameters

Intercropping of legumes did not affect significantly the growth parameters of Guinea grass (Table 1). However, among legumes, *Macroptillium atropurpureum* attained significantly higher plant height (74.6, 138.6, 109.5 and 107.5 cm) as compared to S. *hamata*, C. *ternatea* and S. *seabrana*. While number of branches/plant were increased significantly in S. seabrana (7.4, 9.5 and 8.9) than *Macroptillium atropurpureum*, C. *ternatea* and S. *hamata* during 2nd, 3rd and 4th years respectively (Table 2). Among weed management practices, hand weeding 35 days after sowing in 1st year and 25 days after onset of monsoon rain from 2nd year onwards resulted in significantly higher growth parameters of both grass and legumes than weedy check, pre-emergence application of pendimethalin @ 0.75 kg a.i. /ha and weeding with weeder cum mulcher during all the four years of study (Table 1 and 2). Liu and Revell (2002) indicated that after removal of weeds, the legume component had the ability to grow better than weedy check.

Dry forage yield

Intercropping of *Stylosanthes hamata* with Guinea grass produced significantly higher total dry forage (5.18 t/ ha) than *Clitoria ternatea* (3.89 t/ha), *Macroptillium atropurpureum* (4.19 t/ha) and S. *seabrana* (4.67 t/ha) during 1st year of experiment. While during 2nd, 3rd and 4th years, intercropping of Stylosanthes seabrana with Guinea grass produced significantly higher total dry forage yield (9.56, 6.56 and 6.04 t/ha) than *Clitoria ternatea* (7.92, 5.23 and 4.49 t/ha), *Macroptillium atropurpureum* (8.12, 5.34 and 4.76 t/ha) and S. *hamata* (8.76, 5.97 and 5.26 t/ha). This was due to better survival and growth of S. *seabrana* over the years as compared to S. hamata, Macroptillium atropurpureum and C. *ternatea*. Edye *et al.* (1998) reported that *Stylosanthes seabrana* were consistently superior to other *Stylosanthes* species in seedling and perennial plant density and yield particularly in the third year of the experiment and Basak *et al.* (2003) also reported that *Stylosanthes seabrana* had the best overall yield performance out of twenty cultivars of *Stylosanthes* were evaluated for their growth and yield performance. In total dry forage yields, per cent contribution of S. *seabrana* were maximum (34.90, 31.17, 41.62 and 40.73) during 1st, 2nd, 3rd and 4th years respectively. Clem *et al.* (2001) found that S. *seabrana* was best adapted for use in permanent pastures as compared to various other legumes.

Dry forage yield obtained from Guinea grass based pasture were 4.48, 8.59, 5.78 and 5.14 t/ha during first, second, third and fourth years, respectively. In Guinea grass 116.94% increase in dry forage yield was recorded during second year as compared to first year (3.01 t/ha). While during third and fourth years 39.50% and 5.82% decrease in yields of Guinea grass were observed as compared to second and third years (6.53 and 3.95 t/ha). In legumes also 40.14% increase in dry forage yield was recorded during second year as compared to first year (1.47 t/ha). While during third and fourth years 11.17% and 22.40% decrease in yields of legumes were also observed as compared to second and third years (2.06 and 1.83 t/ha). The higher yield in second year was might be due to higher rainfall as compared to other years. Low rainfall and dry spells at critical growth stages during first and last year might be adversely affected the forage yield.

In weed management practices, hand weeding 35 days after sowing in 1st year and 25 days after onset of monsoon rain from 2nd year onwards recorded significantly higher dry forage yields of both Guinea grass (3.52, 7.81, 4.53 and 4.21 t/ha) and legumes (1.81, 2.48, 2.15 and 1.72 t/ha) than weedy check, pre-emergence application of pendimethalin @ 0.75 kg a.i./ha and weeding with weeder cum mulcher during 1st, 2nd, 3rd and 4th years, respectively. (Table 3). Higher yield were also obtained in maize-legume intercropping system by hand weeding treatment compared to weedy check (Chalka and Nepalia, 2005).

Crude protein yield

Crude protein yields (812.3, 587.0 and 538.7 kg/ha) were also increased significantly when guinea grass intercropped with S. seabrana than intercropping with C. ternatea (661.0, 453.1 and 357.7 kg/ha), Macroptillium atropurpureum (661.1, 455.9 and 389.1 kg/ha) and S. hamata (721.7, 518.8 and 439.9 kg/ha) during 2nd, 3rd and 4th years, respectively. This was due to higher dry matter yield obtained by intercropping of S. seabrana with Guinea grass than S. *hamata*, *Macroptillium atropurpureum* and C. *ternatea*. Crude protein yields (493.5, 870.1, 591.7 and 508.1 kg/ha)

Table 1 : Effect of legumes and weed management practices on growth parameters of Guinea grass

Treatment	Height (cm)				No. of tillers/plant				Tussock diameter (cm)				Leaf stem ratio			
	Yr1	Yr2	Yr3	Y4	Yr1	Yr2	Yr3	Y4	Yr1	Yr2	Yr3	Y4	Yr1	Yr2	Yr3	Y4
Guinea + Legumes																
G + *S. hamata*	124.5	170.2	140.5	148.7	20.3	32.9	25.5	27.4	13.2	15.5	14.1	17.2	0.74	0.70	0.63	0.69
G + *S. seabrana*	122.3	162.9	135.9	143.9	20.2	32.0	24.7	26.5	12.9	15.0	13.7	16.7	0.74	0.69	0.62	0.67
G + *M. atropurpureum*	119.7	160.1	134.2	142.1	19.0	31.2	24.3	26.0	12.3	14.9	13.5	16.4	0.72	0.67	0.62	0.66
G + *C. ternatea*	117.8	155.8	132.4	140.2	18.4	30.5	23.9	25.4	12.1	14.4	13.3	16.0	0.70	0.67	0.61	0.66
SEm±	2.6	5.1	4.0	3.4	0.7	1.1	0.8	0.9	0.4	0.5	0.4	0.5	0.02	0.01	0.01	0.01
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	Ns
Weed control																
Weedy check	108.2	147.0	125.7	133.6	16.4	25.8	20.7	22.4	10.2	12.9	12.1	15.0	0.61	0.58	0.56	0.61
Pendimethalin 0.75 kg a.i./ha	116.7	156.5	132.5	140.0	18.1	29.4	23.0	24.7	11.9	14.1	12.9	17.8	0.69	0.66	0.61	0.65
Weeder cum mulcher	124.7	164.0	137.1	145.6	20.2	32.6	25.2	27.0	13.1	15.1	13.7	16.8	0.76	0.71	0.64	0.67
Hand weeding	134.8	178.7	147.7	155.7	23.0	38.8	29.4	31.2	15.2	17.7	15.9	18.8	0.85	0.80	0.71	0.72
SEm±	2.6	5.1	4.0	3.4	0.7	1.1	0.8	0.9	0.4	0.5	0.4	0.5	0.02	0.01	0.01	0.01
CD (P=0.05)	7.6	14.8	11.5	9.7	1.9	3.1	2.3	2.7	1.2	1.4	1.2	1.5	0.05	0.04	0.03	0.04

were also increased significantly when hand weeding was done at 35 days after sowing in 1st year and 25 days after onset of monsoon rain from 2nd year onwards than weedy check, pre-emergence application of pendimethalin @ 0.75 kg a.i./ha and weeding with weeder cum mulcher during 1st , 2nd, 3rd and 4th years, respectively (Table 4). Moyer *et al.* (2003) also reported that removal of weeds resulted in higher protein yield than weed infested plots. Low rainfall and dry spells in 1st and last years at critical growth stages might be adversely affected the growth parameters and yield of pasture species which also resulted in lower crude protein yield during these years.

Number of weeds and weed dry weight

Intercropping of S. *seabrana* with Guinea grass recorded significantly less number of weeds (40.53, 49.60 and 66.67/ m2) and lower weed dry weight (71.79, 87.38 and 107.98 g/ m2) as compared to C. *ternatea* (number of weeds 52.07, 66.93 and 83.97/m^2 and weed dry weight 84.89, 107.61 and 130.84 g/m^2) during 2nd, 3rd and 4th years respectively. This was due to better survival and growth of S. *seabrana* over the years and their suppressing effect on weeds. Hand weeding also resulted in significantly less number of weeds (17.76, 25.31, 34.35 and 49.80/$m^{2)}$ and lower weed dry weight (31.47, 39.52, 55.09 and 72.16 g/m^2) than weedy check, pre-emergence application of pendimethalin @ 0.75 kg a.i./ha and weeding with weeder cum mulcher (Table 5). Decrease in weed count and weed dry weight by hand weeding were also reported by Sharma and Gill (2005). The common weeds found and removed from the experimental field were *Cynotis sp., Commelina benghalensis, Leucas aspera, Cassia tora, Phyllanthus niruri, Borreria hispida, Fimbristylis diphylla, Parthenium hysterophorus, Celosia argentea, Ipomea pestigridis, Digera arvensis, Tridax procumbence, Sida acuta, Cyperus rotundus, Coculus sp., Miremia emarginata, Miremia triandra and Borreria stricta.*

Economic returns

The Maximum net return (₹4232, 20778, 14532 and 15390/ ha) and net return per rupee invested (Re 0.38, 2.26, 1.64 and 1.63) were obtained by intercropping of Guinea grass with S. seabrana during 1st, 2nd, 3rd and 4th years of study. Hand weeding 35 days after sowing in 1st year and 25 days after onset of monsoon rain from 2nd year onwards also recorded maximum net return (3771, 17053, 9796 and 10183/ ha) during all the 4 years. The higher net returns from S. *seabrana* intercropping and hand weeding was due to higher yields obtained from these treatments.

Table 2 : Effect of intercropping with Guinea grass and weed management practices on growth parameters of legumes

Treatment	Height (cm)				No. of branches/plant			
	Yr1	Yr2	Yr3	Y4	Yr1	Yr2	Yr3	Y4
Guinea + Legumes								
G + *S. hamata*	33.5	67.1	58.3	54.6	4.0	6.2	8.3	7.5
G + *S. seabrana*	36.2	103.1	97.5	104.3	3.2	7.4	9.5	8.9
G + *M. atropurpureum*	74.6	138.6	109.5	107.5	4.0	5.0	4.4	3.7
G + *C. ternatea*	38.6	70.8	82.9	68.5	2.4	5.4	5.8	6.3
SEm±	1.3	2.5	2.5	2.2	0.1	0.2	0.2	0.2
CD (P=0.05)	3.7	7.1	7.3	6.3	0.3	0.5	0.6	0.5
Weed control								
Weedy check	37.3	80.7	76.1	74.3	2.3	4.6	5.6	5.6
Pendimethalin 0.75 kg a.i./ha	43.3	89.7	83.3	80.5	3.4	5.5	6.5	6.2
Weeder cum mulcher	47.7	96.6	88.7	85.3	4.1	6.2	7.1	6.7
Hand weeding	54.7	112.6	100.1	94.9	5.0	7.8	8.7	7.9
SEm±	1.3	2.5	2.5	2.2	0.1	0.2	0.2	0.2
CD (P=0.05)	3.7	7.1	7.3	6.3	0.3	0.5	0.6	0.5

Table 3 : Effect of legumes and weed management practices on dry forage yield of Guinea grass based pasture

Treatment	Dry forage yield (t/ha)														
	Year 1			Year 2			Year 3			Year 4			Average of 4 years		
	G	L	T	G	L	T	G	L	T	G	L	T	G	L	T
Guinea + Legumes															
G + *S. hamata*	3.10	2.08	5.18	6.60	2.16	8.76	3.99	1.98	5.97	3.76	1.50	5.26	4.37	1.92	6.29
G + *S. seabrana*	3.04	1.63	4.67	6.58	2.98	9.56	3.83	2.73	6.56	3.58	2.46	6.04	4.26	2.42	6.68
G + *M. atropurpureum*	2.99	1.20	4.19	6.50	1.62	8.12	3.94	1.40	5.34	3.73	1.03	4.76	4.29	1.31	5.60
G + *C. ternatea*	2.92	0.97	3.89	6.43	1.49	7.92	4.02	1.21	5.23	3.80	0.69	4.49	4.32	1.09	5.41
SEm±	0.08	0.04	0.12	0.17	0.04	0.24	0.11	0.05	0.17	0.08	0.03	0.11	0.11	0.04	0.15
CD (P=0.05)	NS	0.11	0.35	0.49	0.12	0.68	NS	0.13	0.48	NS	0.08	0.31	NS	0.12	0.42
Weed control															
Weedy check	2.60	1.21	3.81	5.57	1.74	7.31	3.50	1.61	5.11	3.34	1.22	4.56	3.76	1.43	5.18
Pendimethalin 0.75 kg a.i./ha	2.84	1.34	4.18	6.11	1.93	8.04	3.76	1.72	5.48	3.57	1.33	4.90	4.08	1.58	5.66
Weeder cum mulcher	3.11	1.52	4.63	6.62	2.10	8.72	4.01	1.84	5.85	3.74	1.41	5.15	4.39	1.72	6.11
Hand weeding	3.52	1.81	5.33	7.81	2.48	10.29	4.53	2.15	6.68	4.21	1.72	5.93	5.02	2.00	7.02
SEm±	0.08	0.04	0.12	0.17	0.04	0.24	0.11	0.05	0.17	0.08	0.03	0.11	0.11	0.04	0.15
CD (P=0.05)	0.22	0.11	0.35	0.49	0.12	0.68	0.31	0.13	0.48	0.23	0.08	0.31	0.31	0.12	0.42

Rainfall received during 2007, 2008, 2009 and 2010 was 553.8, 1267.1, 544.9 and 684.1 mm, respectively. Number of dry spells observations during 2007, 2008, 2009 and 2010 was 5, 4, 3 and 2 SMW-Standard meteorological weeks, respectively.

Table 4 : Effect of legumes and weed management practices on crude protein yield of Guinea grass based pasture

Treatment	Crude protein yield (kg/ha)														
	Year 1			Year 2			Year 3			Year 4			Average of 4 years		
	G	L	T	G	L	T	G	L	T	G	L	T	G	L	T
Guinea + Legumes															
G + *S. hamata*	215.9	267.4	483.3	446.6	275.1	721.7	269.4	249.4	518.8	248.9	191.0	439.9	296.6	250.4	547.0
G + *S. seabrana*	210.3	204.8	415.1	447.0	365.3	812.3	258.9	328.1	587.0	239.8	298.9	538.7	289.0	293.0	582.0
G + *M. atropurpureum*	205.1	167.3	372.4	438.5	222.6	661.1	263.7	192.3	455.9	247.6	141.5	389.1	288.7	186.2	474.9
G + *C. ternatea*	200.0	151.8	351.8	430.7	230.3	661.0	268.3	184.8	453.1	250.8	106.9	357.7	289.3	168.4	457.7
SEm±	5.7	5.5	11.3	11.6	7.1	18.9	7.5	6.1	13.8	7.5	5.2	13.4	9.6	6.8	16.8
CD (P=0.05)	NS	15.8	32.5	NS	20.5	54.4	NS	17.6	39.6	NS	15.0	38.5	NS	19.5	48.5
Weed control															
Weedy check	175.9	160.4	336.3	368.2	227.5	595.7	231.5	207.5	439.0	219.5	157.1	376.6	249.5	188.2	437.7
Pendimethalin 0.75 kg a.i./ha	194.2	179.5	373.7	408.9	254.5	663.4	250.9	223.8	474.7	236.4	172.5	408.9	275.1	201.3	476.4
Weeder cum mulcher	214.8	204.2	419.0	447.4	279.5	726.9	269.2	240.2	509.5	248.5	183.4	431.9	295.0	236.8	531.8
Hand weeding	246.3	247.2	493.5	438.3	331.8	870.1	308.7	283.0	591.7	282.8	225.3	508.1	344.0	271.8	615.8
SEm±	5.7	5.5	11.3	11.6	7.1	18.9	7.5	6.1	13.8	7.5	5.2	13.4	9.6	6.8	16.8
CD (P=0.05)	16.4	15.8	32.5	33.5	20.5	54.4	21.5	17.6	39.6	21.5	15.0	38.5	27.5	19.5	48.5

Table 5 : Effect of legumes and weed management practices on number of weeds and weed dry weight in Guinea grass based pasture

Treatment	Year 1		Year 2		Year 3		Year 4	
	No. of weeds m^2	Weed DW (g/m^2)	No. of weeds/m^2	Weed DW (g/m^2)	No. of weeds/m^2	Weed DW (g/m^2)	No. of weeds/m^2	Weed DW (g/m^2)
Guinea + Legumes								
G + *S. hamata*	33.66	58.46	44.59	76.71	54.12	92.96	70.93	115.50
G + *S. seabrana*	35.91	62.63	40.53	71.79	49.60	87.38	66.67	107.98
G + *M. atropurpureum*	37.62	61.69	44.81	79.65	56.45	99.26	73.15	121.26
G + *C. ternatea*	38.98	62.08	52.07	84.89	66.93	107.61	83.97	130.84
SEm±	1.95	2.18	1.88	2.37	2.53	4.33	2.62	4.95
CD (P=0.05)	NS	NS	5.42	6.82	7.28	12.46	7.54	14.26
Weed control								
Weedy check	50.88	84.83	61.57	106.77	74.14	127.26	91.35	151.86
Pendimethalin 0.75 kg a.i./ha	43.54	70.79	51.84	90.63	63.53	109.54	80.93	133.54
Weeder cum mulcher	34.01	57.76	43.27	77.38	55.07	95.34	72.64	117.98
Hand weeding	17.76	31.47	25.31	39.52	34.35	55.09	49.80	72.16
SEm±	1.95	2.18	1.88	2.37	2.53	4.33	2.62	4.95
CD (P=0.05)	5.62	6.28	5.42	6.82	7.28	12.46	7.54	14.26

Table 6 : Effect of legumes intercropping and weed management practices on economics of Guinea grass based pasture

Treatment	Year 1		Year 2		Year 3		Year 4	
	Net return (₹/ha)	Net return per rupee invested (₹)	Net return (₹/ha)	Net return per rupee invested (₹)	Net return (₹/ha)	Net return per rupee invested (₹)	Net return (₹/ha)	Net return per rupee invested (₹)
Guinea + Legumes								
G + *S. hamata*	6829	0.61	17978	1.95	11679	1.32	11948	1.25
G + *S. seabrana*	4232	0.38	20778	2.26	14532	1.64	15390	1.63
G + *M. atropurpureum*	3113	0.28	15038	1.64	8588	0.97	9128	0.97
G + *C. ternatea*	1517	0.13	14210	1.55	7485	0.85	8033	0.81
Weed control								
Weedy check	2752	0.28	13851	1.80	9903	1.34	10411	1.32
Pendimethalin 0.75 kg a.i./ha	3900	0.38	15718	1.91	10720	1.36	11438	1.30
Weeder cum mulcher	3771	0.32	17053	1.70	9796	0.99	10183	0.96
Hand weeding	5269	0.42	21382	1.98	11865	1.10	12467	1.08

Conclusions

Intercropping of Guinea grass with *S. seabrana* along with hand weeding 35 days after sowing in first year and 25 days after onset of monsoon rain from 2nd year onwards in sandy loam soil was found adequate for higher growth, productivity, quality and monetary return under semiarid rainfed conditions. In legumes *S. seabrana* had better ability to compete with weeds and performed well in association with Guinea grass under semiarid rainfed conditions.

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