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Effect of Weeding-cum-soil Working on Common Bamboo Raised from Culm Cuttings

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ABSTRACT

The management operation like weeding-cum-soil working in bamboo plantations is effective for enhancing growth and yield of bamboo. The Common Bamboo (*Bambusa vulgaris* Schrader ex Wendland), which is a preferred bamboo species for cultivation in many parts of the world, is raised by culm cutting and other vegetative methods because it does not produce viable seed. The experiment was conducted at Orissa University of Agriculture and Technology, Bhubaneswar, India for optimization of weeding-cum-soil working in plantations raised from rooted culm cuttings at a spacing of 5 m 5 m. The study consisted of four different trials carried out in 1st year, 2nd year, 3rd year and 4th year crop separately. In each year trial six different treatments were imposed viz., 0 (Control- T_0), 1 (T_1), 2 (T_2), 3 (T_3), 4 (T_4) and 5 (T_5) number of weeding-cum-soil working per year. The optimum levels of weeding-cum-soil working were found to be three (T_3) in 1st year and 2nd year, two (T_2) in 3rd year and 4th year for the plantations raised from rooted culm cuttings. In case of two numbers (T_2), one practiced during first week of July and the other during first week of September. In case of 3 numbers (T_3), in addition to previous two one more practiced in March of the same year. However, in 1st year all three were practiced during August to October.

Key words:

Bamboo, Bambusa vulgaris, weeding, soil working, culm cutting

INTRODUCTION

The weeding-cum-soil working in bamboo plantations has been found to be effective for enhancing growth and yield of bamboo. This operation is useful for reducing completion to bamboo plants, increasing aeration, temperature and water holding capacity in soil. Shanmughavel et al. (1997) have recommended removal of weeds from bamboo plantation as and when required. The beneficial effects of weeding-cum-soil working have been reported by Anonymous (1973), Solanki et al. (2004), Qiu et al. (1992), Quingyi hin (1995), Maoyi and Banik (1995) and Pandalai et al. (2002). In the present study different levels of weeding-cum-soil working operations were carried out in 1st year, 2nd year, 3rd year and 4th year crop of *Bambusa vulgaris* Schrader ex Wendland (Common Bamboo). It is a moderate sized cultivated bamboo and one of the preferred bamboo species in tropical areas particularly in coastal regions. It is

raised by vegetative methods because it does not produce viable seed and raising by rooted culm cuttings is a suitable method. Hence, optimization of weeding-cum-soil working operations is necessary for raising economic crop from rooted culm cuttings.

MATERIALS AND METHODS

The experiment was conducted at Orissa University of Agriculture and Technology, Bhubaneswar, India for optimization of weeding-cum-soil working in *Bambusa vulgaris* plantation raised from rooted culm cuttings at a spacing of 5 m × 5 m. This study consisted of 4 different trials carried out on 1st year, 2nd year, 3rd year and 4th year crop. In each year 6 different treatments were imposed on 144 separate clumps, hence a total of 576 clumps were studied during the period of investigation. The treatments were 0 (Control- T_0), 1 (T_1), 2 (T_2), 3 (T_3), 4 (T_4) and 5 (T_5) number of weeding-cum-soil working per year. The trials were conducted under Randomized Block Design. The timings of treatments were made in such a way that the effect of the treatments could be assessed in the same year of growth.

The treatments involved removal of weeds by scraping and loosening the soil of root zone upto 10 cm depth using hoe. However, during the time of shoot emergence weeds were pulled by hand instead of scrapping. The treatment which was carried out in the month of October (end of rainy season) involved an additional soil working for *in situ* moisture conservation during following dry period. For this saucer-and-mound method was provided to each plant. The radius of saucer was 100 cm and depth was 10 cm. The dug out earth was partly used in making a small ridge around the saucer and small mound at the base of the plant. The treatment which was carried out in July (beginning of rainy season) involved hoeing of soil in root zone, removal of weeds and filling back of the ridge soil in saucer. The treatment in March involved removal of weeds and loosening of soil to depth of 10 cm in a radius of 100 cm to increase penetration of light, air and summer showers in root zone.

RESULTS AND DISCUSSION

The results of different levels of weeding-cum-soil working in 1st, 2nd, 3rd and 4th year of the plantation are presented in Table 1 - 4.

The results in Table 1 indicate the effect of weeding-cum-soil working on 1st year crop of *B. vulgaris* raised from rooted culm cuttings. The total number of culms per clump was considerably influenced by different levels of weeding-cum-soil working. T_3, T_4 and T_5 (2, 3 and 4 numbers of weeding-cum-soil working, respectively) produced significantly higher number of culms over other treatments, but remained statistically at par with each other. The number of culms increased from T_0 (1.23 culms) to T_3 (1.42 culms) level of weeding-cum-soil working and then it was almost constant.

Similarly, the number of new culms recruited from rooted culm cuttings in 1st year was same as the total number of culms. Hence, the results obtained under total number of culms per clump as explained above was same for the number of new culms recruited per clump.

The different levels of weeding-cum-soil working resulted differential effect on height of dominating culm. The 3, 4 and 5th number of weeding-cum-soil working (T_3, T_4 and T_5) demonstrated significantly more height growth over others. The height growth of culm was enhanced progressively by increase in number of weeding-cum-soil working from 0 to 3, but it did not respond to further increase of weeding-cum-soil working in 1st year. The height under T_3 was 2.14 m in comparison to 1.84 m in T_0 (Control).

The dbh of dominating culm was also influenced by weeding-cum-soil working. Three (T_3) and more number of weeding-cum-soil working significantly increased the dbh. However, the values above 3 (T_3) and more number of weeding-cum-soil working (T_4 and T_5) resulted similar growth.

Table 1. Effect of weeding-cum-soil working on 1st year crop of *B. vulgaris* raised from rooted culm cuttings

Treatments	Total no. of culms/ clump	No. of new culms recruited / clump	Height of dominating culm (m)	DBH of dominating culm (cm)	No. of internodes in dominating culm
T0 (0 no. of weeding -cum -soil working)	1.23	1.23	1.84	0.66	14.90
T1 (1 no. of weeding -cum -soil working)	1.26	1.26	1.90	0.68	15.34
T2 (2 no. of weeding -cum -soil working)	1.30	1.30	1.96	0.70	15.80
T3 (3 no. of weeding -cum -soil working)	1.42	1.42	2.14	0.76	17.24
T4 (4 no. of weeding -cum -soil working)	1.48	1.48	2.22	0.79	17.90
T5 (5 no. of weeding -cum -soil working)	1.48	1.48	2.22	0.79	18.00
SE(m) ±	0.02	0.02	0.04	0.01	0.31
CD (0.05)	0.07	0.07	0.13	0.04	0.94

A differential effect on number of internodes in dominating culm was observed due to different levels of weeding-cum-soil working. T_3, T_4 and T_5 which remained statistically at par with each other (17.24, 17.90 and 18.00, respectively) exhibited significantly higher number of internodes over others. T_3 (3 weeding-cum-soil working) was found suitable in 1st year with respect to number of internodes.

The various effects of weeding-cum-soil working on 2nd year crop of B. vulgaris raised from rooted culm cuttings are presented in Table 2. A comparison of mean values suggests that total number of culms were significantly more in 3, 4 and 5 number of weeding-cum-soil working (T_3, T_4 and T_5) than 0, 1, and 2 number of weeding-cum-soil working (T_0, T_1 and T_2). The 3rd number of weeding-cum-soil working (T_3) was found optimum because beyond this there was no significant increase in total culm number although the number of weeding-cum-soil working increased.

Table 2. Effect of weeding-cum-soil working on 2nd year crop of *B. vulgaris* raised from rooted culm cuttings

Treatments	Total no. of culms/ clump	No. of new culms recruited/ clump	Height of dominating culm (m)	DBH of dominating culm (cm)	No. of internodes in dominating culm
T0 (0 no. of weeding -cum -soil working)	3.86	2.52	3.94	2.04	22.04
T1 (1 no. of weeding -cum -soil working)	4.00	2.56	4.09	2.08	22.73
T2 (2 no. of weeding -cum -soil working)	4.04	2.62	4.20	2.13	23.34
T3 (3 no. of weeding -cum -soil working)	4.32	2.90	4.32	2.20	23.92
T4 (4 no. of weeding -cum -soil working)	4.42	2.98	4.42	2.24	24.46
T5 (5 no. of weeding -cum -soil working)	4.44	3.00	4.48	2.25	24.60
SE(m) ±	0.06	0.04	0.06	0.03	0.25
CD (0.05)	0.19	0.13	0.18	0.09	0.75

With regard to number of new culms recruited, the values increased from zero number of weeding-cum-soil working (2.52 culms/clump) to five number of weeding-cum-soil working (3.00 culms/clump). But the culms recruited at 3, 4 and 5 number of weeding-cum-soil working were statistically similar number. T_3 was found to be optimum number of weeding cum-soil-working in 2nd year from new culm recruitment point of view.

A prominent variation was also noticed in height growth of dominating culm because of different intensities of weeding-cum-soil working. Height growth increased significantly by increase of number of weeding-cum-soil working from zero number (T_0) to three number (T_3) in 2nd year and then got stabilized even if the number of weeding-cum-soil working increased. T_3, T_4 and T_5 remained statistically at par with each other and T_2 was also at par with T_3.

The dbh of dominating culm varied considerably under different regimes of weeding-cum-soil working. It increased upto 3 numbers of weeding-cum-soil working (T_3) remarkably and then became like plateau showing no response to further increase of weeding-cum-soil working. The dbh varied from 2.04 cm to 2.25 cm under different treatments.

The number of internodes in dominating culm also exhibited similar trend like height growth under different levels of weeding-cum-soil

working. It varied from 20.04 to 24.60 number. T_3 and onwards parity in number of internodes in culm was observed. T_3 was also at par with T_2.

The data of 3rd year crop of *B. vulgaris* raised from rooted culm cuttings (Table 3) reveals that different intensities of weeding-cum-soil working exerted differential effect on total number of culms per clump. The total number of culms per clump was increased from zero number of weeding-cum-soil working (T_0) to two number of weeding-cum-soil working (T_2) in 3rd year crop significantly. However, further increase in number of weeding-cum-soil working (T_3, T_4 and T_5) could not yield any significant increase in total number of culms. The total number of culms per clump varied from 9.70 to 10.25 among the treatments.

The number of new culms recruited per clump was influenced by level weeding-cum-soil working. The new culm recruitment was significantly increased from zero number weeding-cum-soil working (T_0) upto two number of weeding-cum-soil working (T_2) and then the recruitment was statistically similar till five number of weeding-cum soil working (T_5). The number of new culms recruited per clump varied from 5.36 to 5.90 under different treatments.

The height of dominating culm also reflected differential growth under different number of weeding-cum-soil working. The height under T_2, T_3, T_4 and T_5 was significantly higher over T_0. However parity in results was obtained between T_0 and T_1 as well as between T_1 and T_2.

Table 3. Effect of weeding-cum-soil working on 3rd year crop of *B. vulgaris* raised from rooted culm cuttings

Treatments	Total no. of culms/ clump	No. of new culms recruited/ clump	Height of dominating culm (m)	DBH of dominating culm (cm)	No. of internodes in dominating culm
T_0 (0 no. of weeding-cum-soil working)	9.70	5.36	6.24	3.30	31.16
T_1 (1 no. of weeding-cum-soil working)	9.95	5.62	6.38	3.38	31.83
T_2 (2 no. of weeding-cum-soil working)	10.16	5.82	6.50	3.44	32.40
T_3 (3 no. of weeding-cum-soil working)	10.22	5.88	6.54	3.47	32.65
T_4 (4 no. of weeding-cum-soil working)	10.24	5.90	6.56	3.48	32.75
T_5 (5 no. of weeding-cum-soil working)	10.25	5.90	6.57	3.48	32.80
SE(m) ±	0.12	0.04	0.05	0.03	0.35
CD (0.05)	0.35	0.13	0.14	0.11	1.04

The dbh of dominating culm also expressed similar trend as that of height under different levels of weeding-cum-soil working. Two and more number of weeding-cum-soil working in 3rd year exhibited considerable variation over zero number of weeding-cum-soil working (T_0). The performance under T_1 to T_5 was statistically alike. The variation of collar diameter was 3.30cm to 3.48 cm among the treatments.

The number of internodes varied from 31.16 to 32.80. Two numbers of weeding-cum-soil working (T_2) was found optimum in 3rd year as far the number of internodes is concerned.

The effect of weeding-cum-soil working in 4th year crop of *B. vulgaris* is depicted in Table 4. The data reveals that intensity of weeding-cum-soil working had marked bearing on total number of culms per clump. A maximum of 17.36 number of culms was recorded under five number of weeding-cum-soil working (T_5) which was statistically at par with 2, 3, and 4 number of weeding-cum-soil working (T_2, T_3 and T_4). T_2, T_3 and T_4 were significantly higher over T_0. T_2 was noticed to be the optimum level of weeding-um-soil working from total number of culms point of view. Further T_1 was statistically similar to T_2.

As regards the number of new culms recruited per clump, two and more number of weeding-cum-soil working exerted significantly higher number of new culms over T_0 (zero number of weeding-cum-soil working). Although the values increased from T_2 and T_5, the values were statistically alike. T_2 was found the optimum level of weeding-cum-soil working in 4th year with respect to number of new culm recruited. While T_1 was at par with T_2.

Table 4. Effect of weeding-cum-soil working on 4th year crop of *B. vulgaris* raised from rooted culm cuttings

Treatments	Total no. of culms/ clump	No. of new culms recruited/ clump	Height of dominating culm (m)	DBH of dominating culm (cm)	No. of internodes in dominating culm
T0 (0 no. of weeding -cum -soil working)	16.86	6.66	8.44	4.59	41.20
T1 (1 no. of weeding -cum -soil working)	17.06	6.86	8.54	4.64	41.70
T2 (2 no. of weeding -cum -soil working)	17 .18	6.98	8.60	4.68	42.00
T3 (3 no. of weeding -cum -soil working)	17.25	7.06	8.66	4.71	42.28
T4 (4 no. of weeding -cum -soil working)	17.32	7.12	8.70	4.72	42.50
T5 (5 no. of weeding -cum -soil working)	17.36	7.16	8.70	4.72	42.58
SE(m) ±	0.09	0.09	-	-	-
CD (0.05)	0.27	0.27	N.S	N.S	N.S

The height, dbh and number of internodes in dominating culm were not influenced significantly under different levels of weeding-cum-soil working in 4th year. However, the range of variation of height, dbh and number of internodes were 8.44 to 8.70 m, 4.59 to 4.72 cm and 41.20 to 42.58, respectively.

Weeding-cum-soil working in first two years' crop resulted in increasing growth and yield parameters such as total number of culms, number of new culms recruited, height of culm, dbh of culm and number of internodes. With increase in the number of weeding-cum-soil working there was proportionate increase in the growth and yield parameters of *B. vulgaris*. Significant increase in the above parameters was recorded with three weeding –cum-soil working operations in the initial two years. In the 3rd and 4th year crop significant increase in growth and yield parameters was observed with two numbers of weeding-cum-soil working, one during first week of July and the other during first week of September. Three weeding-cum-soil working resulting in enhanced growth and yield of B. vulgaris as observed in the present investigation is in contrast with the work carried out by Anonymous (1973) and Maoyi and Banik (1995) who have recommended for one weeding in bamboo. The enhanced growth and yield resulted due to two numbers of weeding cum soil working in the present study is in line with Anonymous (2006). Two weeding-cum-soil working, one during the onset of monsoon and other towards the end of monsoon perhaps resulted in loosening of soil, increasing aeration, improved light penetration, conserved soil moisture and reduced competition, thereby enhancing more culm production and growth of culms.

CONCLUSION

In *B. vulgaris* (Common Bamboo) crop raised from rooted culm cuttings, the optimum levels of weeding-cum-soil working were found to be three in 1st year and 2nd year, two in 3rd year and 4th year for the plantations. In case of two numbers (T_2), one should be practiced during first week of July and the other during first week of September. In case of 3 numbers, in addition to previous two one more practiced in March of the same year. However, in 1st year all three should be practiced during August to October.

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