IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
 Journal Volume 12, Iss 01, 2023

YIELD PERFORMANCE OF LEMONGRASS (*CYMBOPOGON CITRATUS*) UNDERKHAMER (*GMALINA ARBOREA*) BASED AGROFORESTRY SYSTEM OF DIFFERENT PRUNING INTENSITY

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Abstract - The field experiment was conducted at farmer's field Village - Gram Para Near Bargi Dam District - Jabalpur (MP) during Rabi and kharif season of 2021 with four main treatment of pruning intensities P0, P25%, P50% and P75% and 4 subtreaments of nutrient supply T1- fertilizer, T2- vermicompost, T3- organic manure and T4- control without any application. The data should be statistically analyzed with split plot design under *Gmelina arborea* (Khamer) plantation. The result showed that the growth and yield of the lemon grass showed higher under shady condition. The P0% pruning found higher tillers per plant at 30, 60, 90, 120 days after transplanting and at harvest (10.31, 14.64, 15.65, 17.95, 20.25 cm respectively) and plant height at 30, 60 and 90 days after transplanting viz., 30.06 cm, 112.02 cm and 153.24 cm respectively. Among different pruning intensities P25 % found superior among 50 % pruning and 75% pruning . Under sub treatments T3 was superior under height of plant and number of tillers per plant and number of effective tillers per plant among all sub treatments whereas T4 control was found lower in all growth parameter. The higher fresh leaf yield of lemon grass was found under P0 (66.95 q ha^{-1}) among all treatments and in sub treatments T3 (48.84 q ha^{-1}) was superior among all subtreatments.
Keywords: Lemon grass, plant height, Khamer, fresh weight, tillers.

1 INTRODUCTION

Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economical interactions between the different components.

Cymbopogon citratus. It belongs to plant genus *Cymbopogon*, and family Poaceae. Many plants belonging to this family are used for commercial, and medicinal uses. They are high in essential oil content.Lemongrass is indigenous to India. Its aromatic stem, and leaves are commonly used in fresh or dried form in Asian cuisine. It is used in preparation of teas, soups, and curries. In cosmetic industry, the essential oil is added to soaps, and hair care products. Lemongrass is medicinal plant. It is used both internally, and externally. It is effective against catarrh, cough, asthma, bladder disorders, febrile conditions, flatulence, and fever. It has rubefacient (causes dilation of the capillaries, and increases blood circulation) action, and used externally for chronic rheumatic ailments, lumbago, and sprains. The herb

ISSN PRINT 2319 1775 Online 2320 7876
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tea of lemongrass is used in treatment of digestive disorders, reduced blood pressure, cholesterol and heat, antioxidant, antifungal and insects, antidiabetic, strengthens the nervous system. Also, its oil is used in soap, cosmetics and little in perfumes (Dubey 2014 and Reuber 2015).

Branch pruning effectively reduces light interception by the tree canopy, and thus prolongs the number of years that annual crop production can be practiced. However to minimize crop yield suppression, farmers often practice intensive pruning annually before planting annual crops. Intensive pruning may enhance crop yield, but it is incompatible with commercial timber production because the growth rate and quality of the over stories timber trees are severely reduced (Bertomeu and Roshetko 2007).

The fertilization, vermicopost as well as manure are one of the important factors affecting the growth, chemical composition and active materials in the aromatic and medicinal plants. N, P and K fertilizers are very important elements that partake in many compounds in the plant cells (carbohydrates, proteins, lipids, amino acids, nucleic acids, energy compounds and regulation of water relation) (Devlin 1975), another vermicomposte and manure given the abundant levels of the porosity and enrich the bulk density those are impact over the root development and highly nutrient uptake by lemon grass.

2 MATHODS AND MATERIALS

The field experiment was conducted at farmer's field Village - Gram Para Near Bargi Dam District - Jabalpur (MP) during Rabi and kharif season of 2021. Jabalpur is situated at 23°9' North latitude and 79°58' East longitudes with an altitude of 411.78 meters above the mean sea level. The climate of the locality is characterized as typically semi-humid and tropical, which is featured by hot dry summer and cool dry winter. It is classified as" Kymore Plateau and Satpura Hills" agro-climate zone, as per norm of National Agricultural Research Project and is broadly known as rice-wheat crop zone of Madhya Pradesh. As per recent classification of National Bureau of Soil Survey and Land use planning (NBSSLUP), Nagpur, this area belongs to agro-ecological region number 10, named as Central High Lands (Malwa and Bundelkhand), sub-region number 10.1, named as hot sub-humid (dry) eco-region (Malwa Plateau, Vindhayan Scarp land and Narmada Valley). The mean annual rainfall of Jabalpur, based on last 20 years data is 1350 mm which is mostly received from south-west monsoon between mid June to end of September with little occasional rainfall of 67.9 mm during other months. The mean monthly minimum temperature varies between 5.3 to 6.1°C in December and January, and maximum temperature varies between 40 to 42°C during May and June, respectively January is the coldest month of the year with minimum temperature being 5°C. The experiment was laid down with split plot design consist with 4 main treatments P0- no pruning, P25 – 25 % pruning, P50- 50% of pruning and P75- 75% of pruning and three sub treatments T1- fertilizer, T2- vermicompost, T3- organic manure and T4- control without any application. The application dose of subtreatments are T1- Treatments of Fertilizer 60: 40: 40 @N:P:K kg ha^{-1} , T2-Treatments of Vermicompost 3.5tha^{-1} and T3- Treatments of Organic manures15 tha^{-1} in lemongrass farming.

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2.1 Preparation of root slips and Propagation of plants

The crops were propagated by means of rooted slips. Which was obtainedfrom well-grown clumps. Tops of clumps were cut off within 25 cm of the root. The lower brown sheath was removed to expose young roots. and the old roots were clipped off keeping the slip 25-30 cm long. The culm (root portion) was divided into slips containing 2-3 tillers. Two slips were placed into each hole about15 cm deep. Rooted slip of lemon grass was planted at a distance of 60 cm. in rowto row and 60 cm. plant to plant. Fertiliser, varmicompost, organic manures, control During dry season after each harvest one irrigation and subsequently application of recommended dose of fertilizers were to be followed for optimum herb production.

3 OBSERVATION TO BE RECORDED

Plant Height : The height of plants in all the plots was measured from ground level to the tips of tallest leaf at harvesting stage and mean height per plant was recorded. The plant height of aromatic crops were measured at 30, 60, 90, 120 and 150 days after transplanting; 30, 60 and 100 days after first harvesting; 30, 60, 90 and 120 days after second harvesting; 30, 60 and 120 days after third harvesting and 30, 60 and90 days after fourth harvesting and tillers were also counted on same dates.

Number of Effective Tillers -The number of effective tillers per square meter was counted in each plot.

Plant sampling - Plant samples were also taken at all the harvesting stage for the determination of mineral composition.

4 RESULT AND DISCUSSION

4.1 Plant Height

The plant height of lemon grass was found superior in without pruning (P0) at 30, 60 and 90 days after transplanting viz., 30.06 cm, 112.02 cm and 153.24 cm respectively. Among different pruning intensities 25 % pruning of *Gmelina arboria* (P25) showed higher plant height viz., 21.75 cm , 80.13 cm and 109.62 cm respectively at 30, 60 and 90 days after transplanting than 50% of pruning and 75% of pruning. The different types of nutrient supply application T1 showed higher result at 30 DAT (26.98 cm) but at 60DAT and 90DAT the T3 showed higher plant height (95.55 and 130.71 cm). The control T4 showed lowest plant height under *Gmelina arborea* based agroforestry system (Table 1) . Similar type of improvement in vegetative growth parameters of plants was observed by Kumar *et al.* (2020) by the application of phosphate solubilizing bacteria and AM fungi and Nutrients effectively impact on the height of the plant similarly result found Shahi*et.al.*, 2012.

4.2 Number of tiller per plant of Lemon grass

Among different pruning intensity 75% pruning of tree (P75) showed lower number of tillers at whereas P25 showed higher number of tillers. The P0% pruning found higher tillers per plant at 30, 60, 90, 120 days after transplanting and at harvest (10.31, 14.64, 15.65, 17.95, 20.25 cm respectively). Under different subtreatments T3 was highly significantly to T1, T2 and T4 at all times of days after transplanting *Gmelina arborea* based agroforestry system . Number of tillers on Lemmon grass similarly result obtained by Garkebo*et al.*

(2020),Gikuru*et al.*(2022). similar trend estimated palmarosa grass by Mola 2020 and Mohanty*et al.*, 2012 (Table 1).

4.3 Effective tiller per plant

The pruning intensity effect on number of effective tiller per plant at Harvest. The P0 was found significantly superior effective tillers than all the pruning practices(17.21) where as among pruning intensities P25 was superior among P50 and P75 (11.45, 7.24 and 4.10). Moreover T3 (13.79) were significantly higher in T2 and T1 (10.07 and 9.23), whereas T_4 (6.92) was found lower number of effective tiller per plant respectively under *Gmelina arborea* based agroforestry system. (Table 1).

Table No. 1 Plant height of Lemon grass at different day after transplanting (DAT)

Treatment	Plant height			Number of tiller per plant					Number effective tiller per plant	Fresh leaf yield	Dry weight of leaf yield
	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	120 DAT	At Harvest	at Harvest	q ha-1	q ha-1
P0	30.06	112.02	153.24	10.31	14.64	15.65	17.95	20.25	17.21	66.95	40.17
P25	21.75	80.13	109.62	9.64	12.73	10.88	12.78	14.68	11.45	40.43	23.45
P50	20.87	77.12	105.50	9.08	10.71	8.14	9.64	11.14	7.24	22.96	12.17
P75	15.85	59.28	81.10	6.96	7.31	5.00	6.10	7.20	4.10	11.08	5.32
Sem±	1.95	7.40	10.13	0.60	0.72	0.75	0.75	0.75	0.68	2.80	1.73
CD at 5 %	6.23	23.68	32.40	1.93	2.31	2.40	2.40	2.40	2.17	8.96	5.55
T1	26.98	92.27	126.22	7.86	9.99	8.82	10.52	12.22	9.23	32.77	18.84
T2	24.38	93.12	127.39	9.10	11.44	10.01	11.71	13.41	10.07	35.58	20.41
T3	24.37	95.55	130.71	13.48	17.05	14.92	16.62	18.32	13.79	48.84	28.04
T4	12.80	47.61	65.13	5.55	6.91	5.92	7.62	9.32	6.92	24.22	13.82
Sem±	1.64	6.22	8.50	0.69	0.89	0.80	0.80	0.80	0.62	2.29	1.35
CD at 5 %	5.42	20.58	28.16	2.29	2.94	2.64	2.64	2.64	2.07	7.60	4.46

4.4 Fresh leaf yield (q ha^{-1}) and Dry weight of leaf yield (q ha^{-1}) of lemon grass.

Fresh leaf yield in pruning intensity was reflected that P0, P25 and P50 were significantly to P75 whereas P0 and P25 significantly to P50 while P0 was highly significant to P25. Moreover in the different treatments T1, T2, and T3 were significant to T4, while T3 was significant to T1 and T2 under *Gmelina arborea* based agroforestry system (Table 1).

Dry weight of leaf yield in pruning intensity was reflected that P0 P25 and P50 were significantly to P75 whereas P0 and P25 significantly to P50 while P0 was highly significant to P25. Moreover in the different treatments T1, T2, and T3 were significant to T4, while T3

was significant to T1 and T2 under *Gmelina arborea* based agroforestry system. Similar finding also conclude by Singh *et al.* (1997) and Shahi*et.al.*(2012) (Table 1).

5 CONCLUSION

The lemon grass found higher growth and yield performance under shedding condition of *Gmelina arborea* plant whereas the management practices of tree like pruning the 25 % of pruning of khamer plant showed higher growth and yield performance than 50% pruning and 75 % of pruning. Among sub treatments the T3 showed higher growth and yield of lemon grass than T1 and T2. The cultivation of lemon grass without nutrient application (T4) as control showed lower growth and yield performance under *Gmelina arborea* based agroforestry system.

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ISSN PRINT 2319 1775 Online 2320 7876
 Journal Volume 12, Iss 01, 2023

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