Evaluate the Correlation and Regression Studies of Growth, Yield Attributes and Yield of Transplanted Finger Millet (*Eleusine coracana* L. Gaertn) under different weed management

ABSTRACT:

Aim: To evaluate the "Correlation and Regression Studies of Growth, Yield Attributes and Yield of finger millet under different weed management."

Study Design: Randomized Complete Block Design (RBD).

Place and Duration of Study: The field trial was conducted during the *Rabi season of 2021-22* at Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu. The experimental field had a silky clay loam soil composition.

Methodology: The field trial comprised of eight treatments and was replicated three times. In the experimental farm, the variety Paiyur 2 was grown into nursery and transplanted at 25th day with the spacing of 30 × 15 cm and followed the all other agronomic practices. To experimented the following treatments *viz*., T_1- PE of pretilachlor at 1.0 kg ha^{-1},T_2- PE of pretilachlor at 0.75 kg ha^{-1}+ one hand weeding on 35th DAT, T_3- PE of pendimethalin at 0.5 kg ha^{-1},T_4- PE of pendimethalin at 0.5 kg ha^{-1}+ one hand weeding on 35th DATP, T_5- PE of Butachlor at 1.0 kg ha^{-1},T_6- PE of Butachlor at 0.75 kg ha^{-1}+ one hand weeding on 35th DAT, T_7- POE of 2,4-D at 2 kg ha^{-1}on 35 th DAT, T_8- POE of 2,4-D at 2 kg ha^{-1}+ one hand weeding on 35th DAT, T_9- Two hand weeding at 35 DAT and 70 DAT, T_{10}- Unweeded check. The biometric observations were recorded at three specific time points: 35 DAT, 70 DAT, and at harvest stage.

Results: The grain yield was highly significant positive correlation with Straw yield (r = 0.893), Leaf area index (r =0.975), Dry matter accumulation at 70 DAT (r=0.966), Dry matter accumulation at harvest (r =0.966), Productive tillers (r =0.902), Test weight (r =0.903), Weed control efficiency (r =0.797), Nitrogen uptake (r =0.980), Phosphorus uptake (r =0.972), Potassium uptake (r =0.960). However, significant positive correlation with Plant height (r =0.733). From the regression every unit increase in stover yield, plant height, LAI at 70 DAT, crop dry matter at 70 DAT, crop dry matter at harvest, number of productive tillers plant^{-1}, test weight, Weed Control Efficiency and N, P and K uptake by crop substantially increased the grain yield by 0.798, 0.537, 0.951, 0.932, 0.992, 0.812, 0.865, 0.635, 0.960, 0.944 and 0.920 kg ha^{-1} respectively.

Keywords: *Finger millet, Correlation, Regression, weed management, weed control efficiency*.

1.INTRODUCTION

Transformation of the global and local food systems is required to assure the supply of healthy, safe, and nutritious foods in both sustainable and equitable ways. Recent changes in food patterns connected to multigrains have sparked intense in food and nutritional security. The people are now focusing on the nutritional intake of millets, and growing youngsters are given processed millets foods that match their daily nutritional requirements. The increased demand for nourishment has cleared the path for the revival of these once dominant crops. Several diet-related programmes are presently

UNDER PEER REVIEW

popularizing the usage and consumption of tiny millets in various forms. As a result, the food processing industries have been developed value added goods such as flakes, noodles, biscuits, cookies, batter (which is used for consumption), flour, bread, and rice analogues [9], [12].

Between the all species of major millets, Finger millet (*Eleusine coracana* (L.) Gaertn) are the most widely grown in India and it is an important staple crop in many parts of India. It is also known as Bird's foot millet, African millet, Ragi Mangal, and Kezhvaragu in India. This millet having abundant in calcium (~364 mg per 100 g), phosphorus (~320 mg per 100 g) iron, zinc and high fiber content. It has a greater caloric value because of its carbohydrate content. United Nations declared the Year 2023 as the International Year of Millets on 5th March 2021, on the proposal moved by India and supported by 72 countries. As per Assocham's report, India's Finger Millet cultivation area for the crop year 2021-22 is 1.01 million ha, resulting in a total production of 1.67 million tons and a yield of 1747 kg ha^{-1} [2]. In response to impending pandemics in a changing climate, agricultural scientists have concentrated on bolstering the human immune system with natural supplements through dietary diversity. So, these initiatives prompted the acceleration of suitable weed management programmes.

Finger millet is cultivated by broadcast seeding (Sarawale *et al*. 2017), row (drill) seeding (Naik *et al*. 2000a, 2001) and transplanting (Naik *et al*. 2000, 2005) methods of establishment. Transplanting finger millet is more suitable and profitable under much delayed sowing conditions (ICAR 2008). Finger millet is grown in different seasons in different parts of the county. As a rainfed crop, during kharif season, it is sown in June-July in all Indian states except in Uttaranchal and Himachal Pradesh at hills of higher altitudes where it is sown in April-May. It is also grown in the winter season (Rabi) by planting in September-October in Karnataka, Tamil Nadu and Andhra Pradesh and as a summer irrigated crop by planting in January-February in the same states. Thus, analyzing the growth and yield properties of finger millets opens the way for smarter food in the near future by utilizing an efficient and economically feasible weed management strategies.

Weed population and weed biomass of 295/m^2 and 239 g/m^2, were reported to cause 47% reduction in yield in transplanted finger millet, respectively (Bhargavi *et al*., 2016). Continuous application of herbicides 2,4-D (0.4 to 0.8 kg ha^{-1}), butachlor (0.75 to 1.5 kg ha^{-1}) in transplanted finger millet did not show herbicide residues in soil, grain, straw and underground water (in case of butachlor only) at 100 to 120 days of herbicide application Hence, it is important to manage weeds during the critical period of crop weed competition to reduce the crop yield losses caused by weeds and improve the conditions favorable to crop. Therefore, the aim of this study was to identify the most effective way to manage weeds in transplanted finger millet crop.

Weeds are a major constraint and limit productivity as initial slow growth of the finger millet favours growth of weeds competing for sunlight, nutrient and water in early stages of growth [1], [6]. Weeds associated with finger millet have the ability to adjust to fluctuating edaphic and climatic situations. In order to enhance the productivity, reduce production cost and increase profitability of finger millet farming, complete understanding of associated weeds and adoption of appropriate weed management practices is important.

Weed dominance were reported to vary with soil fertility [4], [5] and irrigation (Sankaran *et al*., 1974) [10], Irrigation at 50% available soil moisture decreased weed populations, compared with irrigation at

60% and 70% [10].Weed density and weed biomass increased significantly up to 40 kg N ha^{-1} while relative weed control efficiency and weed index decreased with an increased rate of N [5], The crops essential time of weed crop competition might last anywhere between 45 and 60 days. If weeds are not controlled in the first four weeks after transplantation, yield is reduced by 34 to 61% [7].

2. MATERIALS AND METHODS

2.1 Experimental location and climatic condition

The experiment was conducted during Rabi season of 2021-22 at experimental farm, Karunya Institute of Technology and Sciences, Coimbatore. The experimental site is geographically located in the western agro-climatic zone of Tamil Nadu at 100 56'N latitude and 760 44'E longitude at an MSC of 474 m. The annual rainfall of Coimbatore is 675 mm distributed over 52 rainy days. The mean annual maximum and minimum temperature are 26.62 ℃ and 18.43 ℃ respectively. The mean relative humidity is 85.50 per cent and the mean evaporation is 6.2 mm. The mean bright sunshine hours are 35.7 hrs / day.

2.2. Design and Treatment Detail

The field trial comprised of eight treatments and was replicated three times. The transplanted finger millet variety (Paiyur 2), along with the inclusion of the following treatments: T_1- PE of pretilachlor at 1.0 kg ha^{-1},T_2- PE of pretilachlor at 0.75 kg ha^{-1}+ one hand weeding on 35^{th} DAT, T_3- PE of pendimethalin at 0.5 kg ha^{-1},T_4- PE of pendimethalin at 0.5 kg ha^{-1}+ one hand weeding on 35^{th} DATP, T_5- PE of Butachlor at 1.0 kg ha^{-1},T_6- PE of Butachlor at 0.75 kg ha^{-1}+ one hand weeding on 35^{th} DAT, T_7- POE of 2,4-D at 2 kg ha^{-1}on 35 th DAT, T_8- POE of 2,4-D at 2 kg ha^{-1}+ one hand weeding on 35^{th} DAT, T_9- Two hand weeding at 35 DAT and 70 DAT, T_{10}- Un weeded check.

2.3 Crop Management

The finger millet was sown in nursery and transplanted on 25^{th} day with the spacing of 30 x 15 cm. The fertilizer was applied as 60:30:30 NPK kg ha^{-1} within that 50 % of N and 100 % of P_2O_5 & K_2O applied at the time of transplanting and the remaining 50% of the N should be split into two equal portions and applied at 30 and 45 days after transplanting. The other crop management practices were followed based on local soil and climatic condition.

2.4 Statistically Analysis

To assess the correlation and regression coefficients between the grain yield of finger millet (Y) and various independent variables (X). These variables encompassed of weed density, weed dry matter, crop dry matter accumulation, yield attributes, nutrient removal caused by weeds and nutrient uptake by the crop. The computations were performed based on the methodology outlined by Snedecor and Cochran in 1968. [11].

3. RESULTS

3.1. Correlation

The table (1), Grain yield showed highly significant positive correlation with Straw yield (r = 0.893), Leaf area index (r =0.975), Dry matter accumulation at 70 DAT (r=0.966), Dry matter accumulation at harvest (r =0.966), Productive tillers (r =0.902), Test weight (r =0.903),Weed control efficiency (r =0.797), Nutrient uptake (r =0.980), Phosphorus uptake (r =0.972), Potassium uptake (r =0.960)

UNDER PEER REVIEW

.However , significant positive correlation was showed only with Plant height (r =0.733). Alongside, highly significant negative correlation showed with weed density on 35 DAT (r =0.873), weed density on 70 DAT (r =0.837), weed density on harvest (r =0.797), weed dry weight on harvest (r =0.797), Nutrient removal (r =0.788), potassium removal (r =0.806) and significant negative correlation showed with phosphorus removal (r =0.737).

Stover yield showed highly significant positive correlation with Plant height (r =0.923), Leaf area index (r = 0.921), Dry matter accumulation at 70 DAT (r=0.950), Dry matter accumulation at harvest (r =0.905), Productive tillers (r =0.963), Test weight (r =0.779), Weed control efficiency (r =0.899), Nutrient uptake (r =0.857), Phosphorus uptake (r =0.892), Potassium uptake (r =0.941). Conversely, highly significant negative correlation showed with weed density on 35 DAT (r =0.934), weed density on 70 DAT (r =0.923), weed density on harvest (r = 0.899), weed dry weight on harvest (r =0.899), Nutrient removal (r =0.901), potassium removal (r =0.883), and significant negative correlation with phosphorus removal (r =0.632).

3.2. Regression

The regression (table 2) studies showed that every unit maximize in weed density, N, P and K depletion by weeds at 35 ,70 DAT and at harvest. Similarly, the weed dry matter accumulation at harvest stage also minimized the grain yield of finger millet by 0.762, 0.700, 0.635, 0.635, 0.621, 0.543 and 0.649 kg ha^{-1} respectively. However, every unit increase in stover yield, plant height, LAI at 70 DAT, crop dry matter accumulation at 70 DAT, crop dry matter accumulation at harvest, number of productive tillers $plant^{-1}$, test weight (g), Weed Control Efficiency and N, P and K uptake by crop substantially increased the grain yield by 0.798, 0.537, 0.951, 0.932, 0.992, 0.812, 0.865, 0.635, 0.960, 0.944 and 0.920 kg ha^{-1} respectively.

UNDER PEER REVIEW

Table 1. Correlation coefficient between growth, yield components and yield of finger millet under Western Zone of Tamil Nadu (*Rabi*, 2022-23)

S.NO	Parameters	Grain yield	Stover yield	Plant HT	LAI	Dmp at 70	Dmp at H	PT	TW	WD on 35	WD on 70	WD at harvest	WDW at harvest	WCE	N R	P R	K R	N u	P u	K u
1	GY	1																		
2	SY	0.893**	1																	
3	PH	0.733*	0.923**	1																
4	LAI	0.975**	0.921**	0.774**	1															
5	DMP	0.966**	0.950**	0.835**	0.987**	1														
6	DMP	0.996**	0.905**	0.742*	0.978**	0.968**	1													
7	PT	0.902**	0.963**	0.900**	0.945**	0.949**	0.916**	1												
8	TW	0.930**	0.779**	0.537	0.881**	0.838**	0.936**	0.779**	1											
9	WD	-0.873**	-0.934**	-0.952**	-0.889**	-0.935**	-0.873**	-0.935**	-0.684*	1										
10	WD	-0.837**	-0.923**	-0.964**	-0.868**	-0.912**	-0.836**	-0.938**	-0.637*	0.994**	1									
11	WD	-0.797**	-0.899**	-0.963**	-0.833**	-0.880**	-0.793**	-0.919**	-0.588	0.979**	0.995**	1								
12	WDW	-0.797**	-0.899**	-0.963**	-0.833**	-0.880**	-0.793**	-0.919**	-0.588	0.979**	0.995**	1.000**	1							
13	WCE	0.797**	0.899**	0.963**	0.833**	0.880**	0.793**	0.919**	0.588	-0.979**	-0.995**	-1.000**	-1.000**	1						
14	N removal	-0.788**	-0.901**	-0.965**	-0.831**	-0.876**	-0.786**	-0.921**	-0.584	0.975**	0.993**	0.999**	0.999**	-0.999**	1					
15	P removal	-0.737*	-0.632*	-0.659*	-0.705*	-0.705*	-0.707*	-0.712*	-0.522	0.748*	0.750*	0.743*	0.743*	-0.743*	0.721*	1				
16	K removal	-0.806**	-0.883**	-0.937**	-0.845**	-0.881**	-0.797**	-0.921**	-0.587	0.965**	0.985**	0.992**	0.992**	-0.992**	0.990**	0.795**	1			
17	N uptake	0.980**	0.857**	0.657*	0.939**	0.925**	0.985**	0.846**	0.969**	-0.803**	-0.752*	-0.700*	-0.700*	0.700*	-0.692*	-0.628	-0.695*	1		
18	P uptake	0.972**	0.892**	0.684*	0.956**	0.933**	0.982**	0.886**	0.962**	-0.800**	-0.759*	-0.707*	-0.707*	0.707*	-0.704*	-0.615	-0.707*	0.985**	1	
19	K uptake	0.960**	0.941**	0.777**	0.953**	0.954**	0.977**	0.922**	0.922**	-0.865**	-0.827**	-0.779**	-0.779**	0.779**	-0.777**	-0.597	-0.763*	0.970**	0.983**	1

**** - Significant at 1 %; * - Significant at 5 %**

***Note**: GY(grain yield)kg/ha^{-1}, SY (stover yield) kg/ha^{-1},PH (Plant height at harvest)cm, DMP at 70 DAT and harvest (kg/ha$^{-1)}$ (Dry matter production at 70 DAT and at harvest)(g), P.T (Productive tillers), TW (test weight)(g), W.D 35, 70 and harvest (weed density at 35 , 70 DAT and at harvest), WDW (weed dry weight)(g), NR (nitrogen removal), P R(phosphorous removal kg/ha^{-1}) and K R (potassium removal),NPK UPTAKE (Nitrogen ,phosphorus and potassium uptake) kg/ha^{-1} *P<0.05; **P<0.01 are the probability levels for significant of Pearson correlations (two tailed).*

UNDER PEER REVIEW

Table 2. Regression coefficients (b values) and intercept (a) of different component traits on grain yield of pearl millet along with their coefficient of determination (R^2)

Characters	Intercept (a)	Regression coefficients (b values)	R^2	Regression equation Y= a+ bx
Stover yield	55.72	0.63	0.798**	$Y=55.72+0.63\ X_1$
Plant height	687.87	17.15	0.537*	$Y=687.87+17.15\ X_2$
Leaf area index at 70 DAT	-382.66	2103.82	0.951	$Y=-382.66+2103.82\ X_3$
DMP at 70 DAT	-519.70	1.57	0.932	$Y=-519.70+1.57\ X_4$
Dmp harvest	486.56	0.59	0.992	$Y=489.56+0.59\ X_5$
Productive tillers	-1082.02	1079.33	0.812**	$Y=-1082.02+1079.33\ X_6$
Test weight	-23188.88	8971.28	0.865**	$Y=-23188.88+8971.28\ X_7$
Weed density at 35 DAT	3033.16	-26.01	0.762**	$Y=3033.16-26.01\ X_8$
Weed density at 70 DAT	2918.30	-18.86	0.700**	$Y=2918.30-18.86\ X_9$
Weed density at harvest	2737.58	-15.22	0.635**	$Y=2737-15.22\ X_{10}$
Weed dry weight at harvest	2737.58	-0.30	0.635**	$Y=2737.58-0.30\ X_{11}$
Weed control efficiency	1186.21	15.51	0.635**	$Y=1186.21-34.09\ X_{12}$
Weed N removal	2709.13	-34.09	0.621**	$Y=2709.13-34.09\ X_{13}$
Weed P removal	2677.29	-123.53	0.543*	$Y=2677.29-22.83\ X_{14}$
Weed K removal	2723.42	-22.83	0.649**	$Y=2723.42-22.83\ X_{15}$
Crop N Uptake	846.85	42.89	0.960	$Y=846.85+42.89\ X_{16}$
Crop P Uptake	1344.72	79.50	0.944	$Y=1344.72+79.50\ X_{17}$
Crop K Uptake	1188.29	83.38	0.920**	$Y=1188.29+83.38\ X_{18}$

UNDER PEER REVIEW

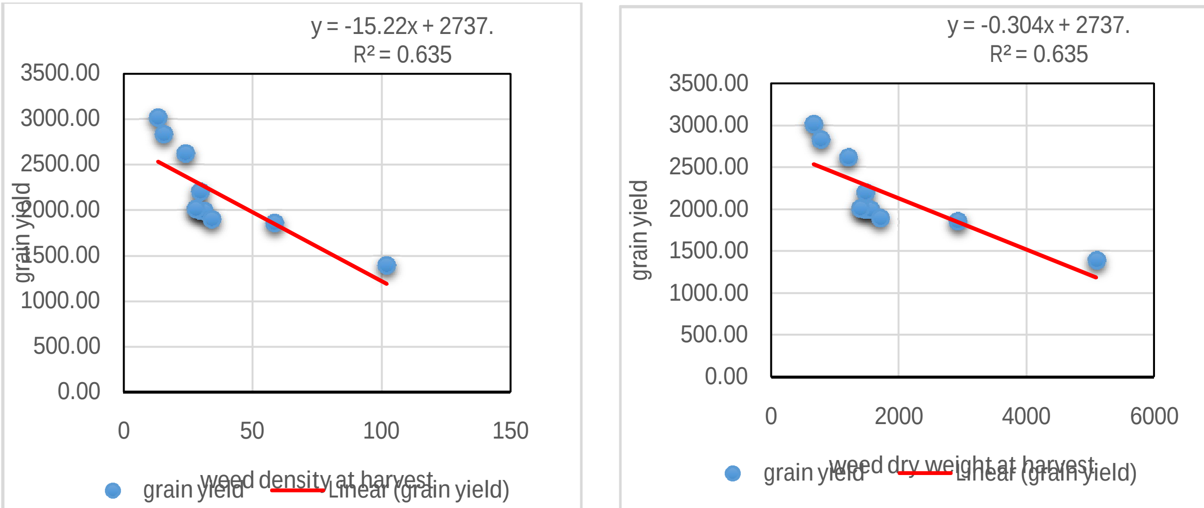

Fig 1: Negative linear regression relationship of grain yield with weed density and weed dry weight at harvest.

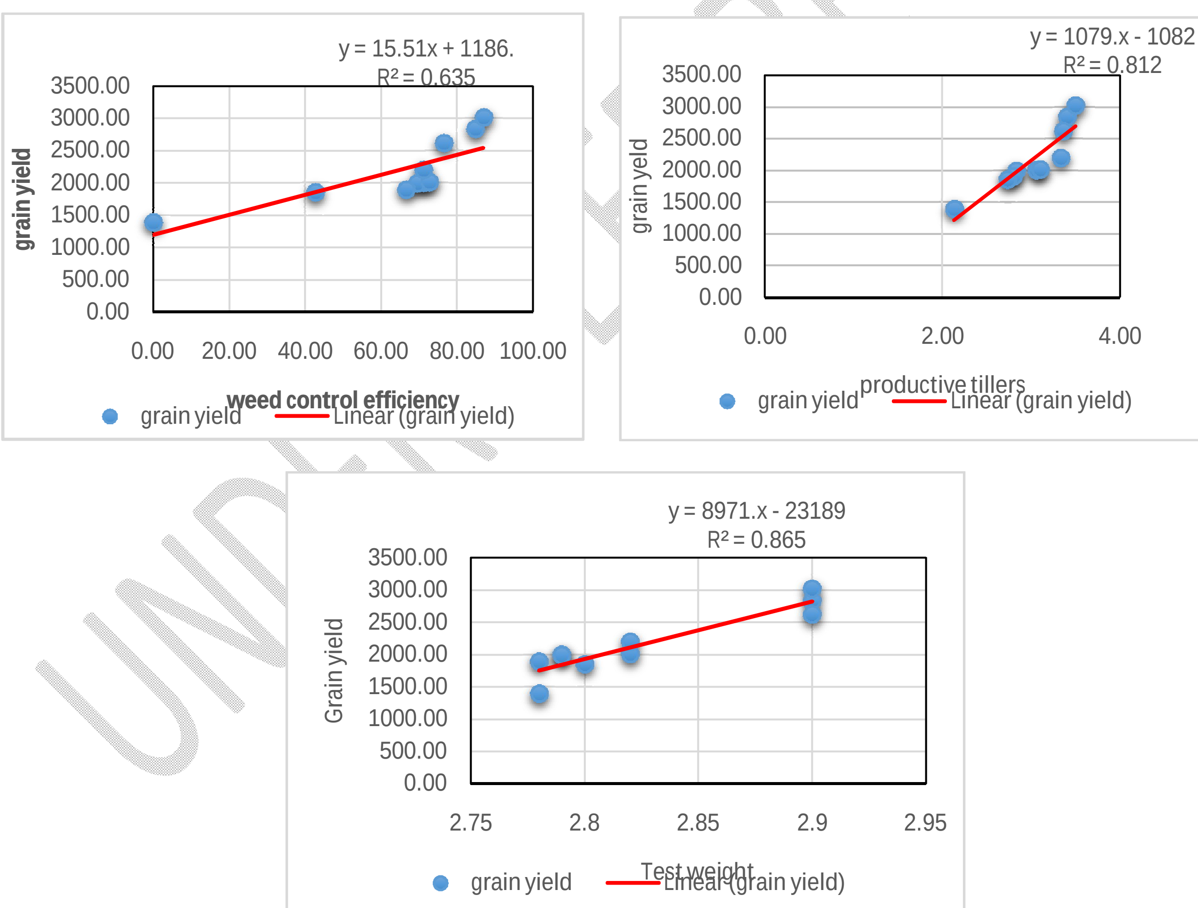

Fig 2: positive linear regression relationship of grain yield with Weed control efficiency, productive tillers and test weight

Discussion

The findings from correlation and the regression studies exposed a strong negative impact (Fig. 1) of weed density, weed dry weight, and nutrient removal on grain yield. The presence of high weed density, increased weed dry weight, and substantial nutrient removal by weeds had detrimental effects on the overall grain yield. The coefficient of determination (R^2) was 0.762, 0.700, 0.635, 0.635, 0.621, 0.543, 0.649. which indicate 76.2%, 70%, 63.5%,63.5%,62.1%,54.3% and 64.9% variation in grain yield. The decrease in grain yield can be attributed to the adverse impacts of extensive weed infestation, which significantly reduced the availability of essential resources required for optimal crop growth right from the early stages of development. This persistent weed presence had detrimental effects on the crop as it competed for crucial resources such as water, nutrients, and sunlight.

The heavy weed infestation acted as a drain on these essential resources, depriving the crop of the necessary inputs needed for its proper development. With limited access to water, the crop faced difficulties in maintaining proper hydration levels, leading to water stress and reduced physiological functions. Moreover, the weeds competed with the crop for nutrients present in the soil, resulting in nutrient depletion. This nutrient competition hindered the crop's ability to absorb an adequate amount of nutrients, which are vital for various metabolic processes and growth stages. Consequently, the crop experienced nutrient deficiency, affecting its overall vigor and growth potential. In addition to water and nutrient competition, the extensive weed coverage also obstructed the crop's access to sunlight. Sunlight is crucial for photosynthesis, the process through which plants convert light energy into chemical energy, enabling them to produce carbohydrates and support their growth. The overshadowing effect of the weeds limited the amount of sunlight reaching the crop, thereby reducing its photosynthetic capacity and impeding its energy production. Due to the combined effects of water stress, nutrient deficiency, and reduced photosynthesis, the crop was unable to reach its full growth potential. This inhibited growth, in turn, led to a subsequent decrease in grain yield. The competition for resources, caused by the heavy weed infestation, severely hampered the crop's ability to utilize available inputs efficiently, resulting in reduced productivity and overall grain yield.

Additionally, the correlation indicated a positive correlation (Fig. 2) between plant height and grain yield. This might be due to lower weed density, as evidence by reduced weed dry matter in those treatment. This reduction in weed competition may have facilitated more efficient utilization of available growth resources by the crops, ultimately contributing to their improved growth and stature these findings are consistent with those reported by (Adikant Pradhan *et al.*,2010) [1]. Collectively, these factors had a positive influence on grain yield, indicating their combined impact on overall crop productivity.

Furthermore, the regression studies showed that a strong positive relationship between productive tillers, weed control efficiency, potassium uptake and grain yield. For productive tillers, the diligent implementation of weed management practices led to an enhanced availability of growth resources, thereby facilitating a notable increase in the number of tillers per plant. As a result, the greater number of tillers had the potential to translate into a higher count of productive tillers per square meter. This

UNDER PEER REVIEW

outcome highlights the positive impact of effective weed management on promoting optimal tiller production and ultimately improving crop productivity. similar out comes have been reported by Adikant Pradhan *et al*., (2010) [1]. So, effective weed management practices positively influence productive tillers production and ultimately contribute to enhanced crop yields. For positive correlation with weed control efficiency, this is due to improved management of weeds throughout the crop growth period resulted in a reduction of both the weed population and the dry weight of weed. weedy check recorded lowest weed control efficiency over the other treatments. Due to the higher weed population and increased dry weight of weeds were attributed to the inadequate control measure implemented, leading to lower weed control efficiency this result was recorded by (Basavaraj *et al*., 2013) [2]. For potassium uptake, the effect of different weed control treatments on nutrient uptake in finger millet was remarkable, with the highest levels of nitrogen, phosphorus, and potassium being observed. The significant outcomes can be attributed to the highly effective weed control achieved through the implementation of various weed control treatments. These treatments successfully reduced weed density, creating optimal conditions for the robust growth and development of finger millet plants. Consequently, there was a substantial increase in nutrient uptake by the plants, reinforcing the findings reported by previous studies conducted by Naik *et al*., (2000) [4].

4. Conclusion

In conclusion, correlation and regression analyses are invaluable tools in weed management in finger millet cultivation. They enable the identification of significant factors, quantification of relationships, prediction of outcomes, optimization of practices, and efficient allocation of resources. By applying these statistical techniques, farmers and researchers can make informed decisions to effectively manage weeds, optimize nutrient availability, and maximize grain yield in finger millet cultivation.

A comprehensive examination of regression and correlation studies has provided a robust and definitive comprehension of the factors that greatly affect the yield of finger millet. By analyzing correlations, it has been established that several key parameters, namely productive tillers, test weight, weed control efficiency, and potassium uptake, have significant positive influences on the grain yield of finger millet. Additionally, important yield characteristics such as effective plant height and stover yield have been found to exert substantial positive effects on the grain yield of finger millet.

On the contrary, the grain yield of finger millet experiences significant negative impacts when faced with high weed density at 35, 70 days after sowing (DAT), and during the harvest stage. Furthermore, increased weed dry weight and the removal of nutrients by weeds have been identified as additional factors that detrimentally affect grain yield. These findings highlight the critical significance of effectively managing weed infestation and optimizing nutrient availability in order to maximize the grain yield in finger millet cultivation.

UNDER PEER REVIEW

REFERENCE

1. Adikant P, Rajput, A. S and Thakur A. Effect of weed management on growth and yield of finger millet. Indian journal of Weed Science. 2010 ;42 (1&2): 53-56.

2. Patil B, Reddy V.C, Mallesha and Gururaj Kombali. Weed control efficiency and economics of non-chemical weed management practices in transplanted organic finger millet. Green Farming.2014;5 (3): 483-485.

3. Bhargavi B, Sunitha N, Reddy YR and Reddy GP. Efficacy of herbicides on weed suppression in transplanted finger millet (Eleusine coracana). Indian Journal of Agronomy .2016; 61(1): 109–111.

4. Beniwal A and Patil C. A study on the consumer perception towards organic food products in Punjab. Asian Journal of Agricultural Extension, Economics and Sociology,2022; 40(8): 26-38

5. Channa Naik. D, Muniyappa. T.V and Dinesh Kumar. M. Response of transplanted finger millet (*Eleusine Coracana*) on yield and economics as influenced by integrated weed- management practices. Indian journal of agronomy,2000;45(1):138-142.

6. ICAR (Indian Council of Agriculture Research). Research achievements of AICRPs on Crop Science. Directorate of Information & Publications of Agriculture, Krishi Anusandhan Bhavan. Indian Council of Agricultural Research, New Delhi. 2008.

7. Kandasamy OS, Bayan HC, Santhy P and Selvi D. Long– term effects of fertilizer application and three crop rotations on changes in the weed species in the 68th cropping (after 26 years). Acta Agronomica Hungarica,2000; 48: 149–154.

8. Kumar R, Prasad SM and Prasad CR. Nitrogen levels and interculturing in relation to weed dynamics and economics of finger millet (Eleusine coracana). Journal of Applied Biology.2000;10(1): 47–50.

9.Mishra JS, Kumar R, Upadhyay PK and Hans H. Weed management in millets. Indian Farming.2018; 68(11): 77–79.

10. Naik DC, Muniyappa TV and Kumar MD. Response of transplanted finger millet (Eleusine coracana) on yield and economics as influenced by integrated weed–management practices. Indian Journal of Agronomy. 2000a; 45: 138–142.

11. Naik DC, Muniyappa TV and Kumar MD. Integrated weed management studies in drill sown fingermillet. Karnataka Journal of Agricultural Sciences. 2001;14: 900–904.

12.Naik DC, Muniyappa TV and Kumar MD. Effect of integrated weed management on nutrient uptake by transplanted ragi and associated weeds. Karnataka Journal of Agricultural Sciences. 2000; 13: 819–823.

13. Naik DC, Muniyappa TV and Naik BG. Response of transplanted ragi on yield, weed density and weed biomass as influenced by chemical and mechanical method of weed control. Mysore Journal of Agricultural Sciences. 2005; 39: 26– 30.

14. Pandey S, Sonboir HL and Thawait D. Evaluation of post emergence herbicides on growth parameters of finger millet. International Journal of Current Microbiology and Applied Sciences. 2018; 7(03): 1126–1134.

UNDER PEER REVIEW

15. Reddy Venkata Ram Teja and Dipti B. General Review of major, minor millets nutrient composition, Production and bioavailability. International Journal of Research and Analytical Reviews (IJRAR). 2020; 7(4):2349-5138.
16. Sankaran S, Subbiah E and Rajagopal A. Studies on chemical weed control in relation to irrigation levels in finger millet (Eleusine coracana Gaertn.). Madras Agricultural Journal.1974; 61: 433–438.
17. Sarawale PP, Rajemahadik VA, Shendage GB, Kumhar BL and Mote AD. Effect of different establishment methods and varieties on yield, quality and nutrient uptake of kharif finger millet (Eleusine coracana (L.) Gaertn.). International Journal of Current Microbiology and Applied Sciences.2017; 6: 1285–1289.
18. Snedecor GW. and Cochran WG. Statistical Methods. Oxford and IBH Pub. Co., New Delhi. 1968.
19. Zhang, K., Jia, X., Zhu, Z., and Xue, W. Physicochemical properties of rice analogs based on multi-level: Influence of the interaction of extrusion parameters. Int. J. Food Prop. 2020; 23 (1): 2033–2049. doi:10.1080/10942912.2020.184038.

UNDER PEER REVIEW