http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (7): 1131-1133, 2000

Contribution of Some Millet Production Factors Towards Yield and Economic Return under the Agro-climatic Conditions of D.I. Khan

Muhammad Bashir Ahmad, Khizar Hayat, Qamar Zaman and Muhammad Ilyas
Agricultural Research Institute, D.I. Khan, Pakistan

Abstract: Contribution of different factors responsible for the increase of millet production viz: improved variety, fertilizer, seed rate and method of sowing were determined in Kharif, 1996 and 1997 under the agro-climatic conditions of D.I. Khan, Pakistan. The investigations measured the average maximum yield gap between the improved practices and that of the farmer's practices as 929 kg ha^{-1}, showing an increase of 202.83 percent over that of farmer's practices. The highest share was contributed by method of sowing, 24.77 percent; followed by improved variety, 24.42 percent, fertilizer, 22.84 percent and seed rate, 7.3 percent. The highest net return and Value Cost Ratio (VCR) of the Rs. 2255.34/ha and (1:5) respectively, were found for improved variety, followed by method of sowing as Rs. 2053.94/ha and 1:3.68 (VCR) respectively. The minimum net return of Rs. 682.84/ha was observed for seed rate.

Key words: Millet, variety, fertilizer, seed rate, method of sowing, grain yield, yield gap, cost analysis, Pakistan

Introduction

Evaluation of high yielding varieties in itself is not enough to increase production, if other inputs such as recommended doses of fertilizer, seed rates, method of sowing and adoption of plant protection measures are not in consonance.

Manjunath and Muniyappa (1990) observed that finger millet increase yield when isoproturon at 0.25 kg + metoxuron 0.37 kg pre-emergence with inter row cultivation 35 DAS. In field trials, yie-lds of wheat, peas, lentil and toria after finger millet was 3.01, 1.51, 1.75 and 0.70 tha^{-1}, respectively. Prakash *et al*. (1991). Robinson (1991) reported that the yield increase as N application increased. Pearson *et al*. (1982) found that two genotypes combined good grain yield with desirable traits. Gumaniue *et al*. (1984) found that two varieties out yielded the local check at most of the sites. Gono (1986) observed that application of N at 40 kg ha^{-1} increased not return than all other doses of N application to the crop. Dhillon *et al*. (1987) in their studies revealed that the response of pearl millet to applied P responded significantly up to 30 kg P_2O_5/ha. Khanvilkar *et al*. (1988) concluded grain yields increased from 0.87 to 1.39 P/ha with increasing N rates and from 0.87 to 1.30 P/ha with increasing P rates. They further stated that 50 kg N + 40 kg P/ha gave the highest grain yields of 1.43 P/ha compared with 0.44 P/ha without N P. Pareek and Shaktawat (1988) observed that grain yields was 0.66, 0.84, 0.98 and 1.18 tha^{-1}, respectively with above levels of N/ha. They further revealed that application of 0 and 50 kg P_2O_5/ha gave yields of 1.16 and 1.19 tha^{-1} respectively. Studies of Rafey and Srivastava (1988) on finger millet revealed that grain yields were similar with sowing rates of 6-10 kg ha^{-1}. They further stated that grain yields of finger millet was similar (1.71.74 tha^{-1}) when grown by sowing seeds or transplanting seedlings. Crop grown in rows 25, 35, or 45 cm apart gave yields of 1.82, 1.79 and 1.61 tha^{-1}, respectively. Sheshadri *et al*. (1988) studied the performance of different entries with standard variety under 3 N levels (50, 75 and 100 kg ha^{-1}). They stated that MR2 produced the highest grain yield of 3022 kg ha^{-1}. They further observed that increased N levels enhanced yields and tillers/plant significantly in all the entries. Maliwal *et al*. (1989) conducted a field trial at sardar krushinagar on millet cv. c.j.104 with various level, of N and P. They reported that the hig-hest grain yields (1.32 tha^{-1}) was obtained with 75 kg N+25 kg P_2O_5/ha. They further stated that N+P interaction was also significant. Labe *et al*. (1987) conducted a field trials to compare direct sowing, slanted and upright transplanting of millet; They concluded that direct sowing gave the highest number of flowering tillers/plant and tallest plants. They also reported that direct sowing also gave the highest average grain yields of 1.32 t ha^{-1}.

Gautam and Kaushik (1988) gave average yields of 1.41 and 1.13 t ha^{-1}, respectively. They further stated that the yields of BK 560-230 were increased to 1.94 t ha^{-1} by inter-row cultivation yields were further increased to 2.37 t ha^{-1} with application of 40 kg N/ha.

Materials and Methods

In order to assess the gap between farmer's yields and yields due to improved practices, studies on relative effects of variety, fertilizer, seed rate and method of sowing measures on grain yield of millet were carried out at Agriculture Research Institute, D.I.Khan during Kharif, 1996 and 1997. In first test factor, which was variety, local seed was used in case of Farmer's Practice (FP), while improved variety DBR-III was used in Improved Practice (IP). In the second test factor, which was fertilizer, no fertilizer was used in case of farmer's practice, while 60-30 kg NP/ha was applied in case of improved practice. All P and half N was applied at sowing time, while remaining half N was side dressed before find irrigation. In the third test factor, 12.50 kg ha^{-1} seed rate was used in farmer's practice, while 6.25 kg ha^{-1} seed rate was used in improved practice. In forth test factor, seed was broadcast in case of farmer's practice, while line sowing was done with 60 cm apart from row to row and 15 cm plant to plant in improved practice. During the consecutive years, the experiment design was factorial with four replications. The data were analysed statis-tically by method as prescribed by Le Clerg *et al.* (1962). The L.S.D was tested at 5% and 1% level of significance. The data on grain yield in kg/plot was recorded and was then converted to kg ha^{-1} combined two year data have been analyzed and are presented in the tables. The percent contribution was calculated by dividing grain yield gap over test factor contribution and multiplied by 100. The test factor contribution was calculated by the difference between means of improved yield and those of farmer's yield of individual test factor.

The field experiment was designed to estimate per hectare potential yield gap, factor contribution and yield level of various treatment. The 2^4 complete factorial component was applied. The factorial component consisted of factors (production inputs) at two levels, i.e (a) farmer's level and (b) improved level. The size of the experimental plots were kept smaller so that it could easily be controlled. There were sixteen treatments and each treatment had four replications. The layout plan was based upon randomized complete block design. The dimensions of each sub-plot was 2.40 x 5 = 12 square meter. Random sampling technique was applied for assigning a given treatment to cover heterogeneity of the soil, if any.

The complete factorial design was applied because it generate data for estimation of yield gap, contribution of individual test factor. The traditional statistical analysis of variance was applied on the yield data to determine whether the contribution of test factors was statistically significant the benefit cost ratios have been calculated for the test factors in order to determine their relative profitability.

Results and Discussion

The results of this study showed that variety, method of sowing (line sowing) and fertilizer in terms of improved practices have significantly increased the millet grain yield, where as seed rate at improved practices have no significant effect on millet grain yield (Table 1) during both the years. These findings are in the agreement with the results reported by Gumaniue *et al*. (1984), Gono (1986), Sheshadri *et al*. (1988), Maliwal *et al*. (1989), Labe *et al*. (1987) and Gautam and Kaushik (1988). The per hectare yield gap was determined as the difference between the yield obtained with all test factors at improved level (T-16) and the yield obtained at farmer's level (T-1). Table 2 indicates that there was 929 kg ha^{-1} average yield gap for both the years, showing an increase of 202.83 % over that of farmer's practice. It means that there is a great scope for enhancing millet productivity. The contribution of individual test factor was calculated by Yate's method which was essentially the source of 1RRI methodology. The contribution of individual test factors was calculated as the difference between averaging the yield over all treatments obtained with that test factor at the farmer's level and the average of yield over all treatments given by that test factor at the improved level.

Table 2 shows that method of sowing, variety and fertilizer application practices were the most prominent constraints in this study. Their contribution towards average grain yield increase was 24.77, 24.42 and 22.84% respectively during both the years, (Table 2).

A large potential yield gap and the significant contribution of individual test factor are not likely to provide sufficient incentive for an average Pakistani farmer to adopt improved practice, unless he perceives the physical return in his subjective perspective. The farmer would also like to relate it to himself, interpret it meaningfully and get signals for his farm production behavior aimed at profitability of the improved input. The basic premises behind the economic analysis is that

Table 1: Average grain yield of millet (kg ha^{-1}) as affected by various factors of millet trial at ari, D.I.Khan during kharif, 1996 and 1997

TreatmentS .No.	Factors				Average grain yield of both the years (kg ha^{-1})
	Variety	Fertilizer	Seed Rate	Method of sawing	
T1	FP	FP	FP	FP	458
T2	IP	FP	FP	FP	788
T3	FP	IP	FP	FP	657.5
T4	FP	FP	IP	FP	589
T5	FP	FP	FP	1P	756
T6	IP	IP	FP	FP	997
T7	IP	FP	IP	FP	658.5
T8	IP	FP	FP	IP	836.5
T9	FP	IP	IP	FP	706.5
T10	FP	IP	FP	IP	856.5
T11	FP	FP	IP	IP	754
T12	IP	IP	IP	FP	887.5
T13	IP	fP	FP	IP	1041.5
T14	IP	FP	IP	IP	974
T15	FP	IP	IP	IP	978
T16	IP	IP	IP	IP	1387

Input factor	F.P= Farmer's practice	IP=Improved practice
1. Variety	Local	DBR-III
2. Fertilizer	NIL	One bag DAP+1.5 bags urea/ha
3. Seed rate	12.5 Kg ha^{-1}	6.25 Kg ha^{-1}
4. Method of sowing broadcast	Line sowing 60 cm apart	

Table 2: Average yield qap and factor contribution for millet trial ari, d.i. khan during kharif, 1996 and 1997

Improved practices	Farmer's practice	Yield gap	Per hectare in kg			
			Yield contribution of each factor			
			Variety	Fertilizer	Seed rate	Method of sowing
1387	458	929	** 226.930	** 212.212	NS 67.865	** 230.130
Average % age of each factor			24.42%	22.84%	7.30%	24.77%

1. Improved Variety D8R-111 **Significant at 1 %
2. One bag DAP+ 1.5 bag urea/ha N.S Non-significant
3. 6.25 kg ha^{-1}
4. Line sowing 60 cm apart

Table 3: Economics of average individual test factor for millet at ad, d.i.khan during 1996 and 1997

								Per hectare in Rupees	
1	2	3	Col (3-2) x 1.10	Col (8) x 1/6) + Col (7) x .01	Col (4+5)	7	Col (7) x Rs 12.25^{+}	Col (8-6)	Col (8-6)
Test factor	input -------------------------------- Farmer's	cost Improvemed	Added including interest cost 10% 4	1/6th of factor contribution i.e. harvesting etc. cost plus Rs. 10/per 100kg 5	Tadded cost 6	Constibution of test factor in in kg ha^{-1}	Value of the contribution in Rs.	Net return	Value cost Ratio (VCR)
Variety	56.25(a)	93.75(b)	41.25	483.30	524.55	226.930	2779.89	2255.34	5.29:1
Fertilizer		1095.00(c)	1106	453.25	1559.25	212.212	2599.60	1040.35	1.66:1
Seed rate	93.75	93.75 (e)	-	148.50	148.50	67.865	831.34	682.84	5.59:1
Methodsowing	100.00	350.00 (g)	275	490.15	765.15	230.13	2819.09	2053.94	3.68:1

\+ = per kg market price

(a) Local seed market price at Rs. 9/= /kg

(b) Improved variety DBR-111 price at Rs. 15/= /kg

(b) Cost of one bag OAP and 1.5 bag urea at Rs. 555/- and Rs. 360/ = /bag respectively

(d) Cost of local seed market price at Rs. 9.00/kg for 12.6 kg ha^{-1}

(e) Cost of 6.25 kg ha^{-1} improved seed (013R-111) at Rs. 15.03/kg

(f) Broad casting sowing charges of labour for 2 mandays at Rs. 50.00/manday

(g) Line sowing charges of labour for 5 mandays at Rs. 50.00/ manday plus one thinning charges at Rs. 100.00/thinning

the typical farmer is more likely to adopt the improved technology package when he is convinced of better monetary returns over his additional investment. Table 3 presents economics of average contribution of individual test factor for millet. The cost of individual input were worked out separately at farmer's and improved levels in rupees on per hectare basis. The difference between farmer's and improved practices was taken as additional input cost for the given test factor. A 10 percent interest rate was added on the additional input cost to accommodate farmer's opportunity cost for his investment. Additionally, about 17 % of the total output value of the test factor was added to total input cost to cover the harvesting, threshing, cleaning and weighing charges. Lastly, Rs. 10.00 per 100 kg was included as average transport cost from farm to threshing floor and from there to the nearest procurement center. The B.C. ratio were calculated by dividing additional (marginal) output value by additional (marginal) input cost. Table 3 shows the economics of average contribution of individual test factors. The table shows that variety, method of sowing and fertilizer at improved level gave the highest net return of As 2255.34, 2053.94 and 1040.35 with VCR of 5.29, 3.68 and 1.66, respectively.

References

Dhillon, N.S., A.C. Vig, M. Chand, B. Singh and G. Dev, 1987. Critical level of phosphorus in soils of Punjab and response of pearl millet to applied phosphate. J. Indian Soc. Soil Sci., 35: 238-243.

Gautam, R.C. and S.K. Kaushik, 1988. Maximization of yield of rainfed pearlmillet (*Pennisetum typhoides*). Indian J. Agric. Sci., 58: 223-224.

Gono, L.T., 1986. Response of pearlmillet to nitrogen in different agroecological zones of zimbabwe. Proceedings of the 3rd Regional Workshop on Sorghum and Millet for Southern Africa, October 6-10, 1986, Lusaka, Zambia.

Gumaniue, L., P. Varga and C. Olaru, 1984. Yield earliness and quality of millet variety as a second crop. Analel Institueu de Cercetari Pentrue Cereals S. Plante Technic Fundules, 51: 105-113.

Khanvilkar, S.A., R.G. Wagh, S.B. Kadrekar and S.T. Thorat, 1988. Response of common millet to different levels of nitrogen, phosphorus and plant densities in roteretic soil of coastal Maharashtra. J. Ind. Sco. Coastal Agric. Res., 6: 29-32.

Labe, D.A., P.N. Egharevba, J.Y. Yayock and S.O. Okiror, 1987. Effect of planting methods on the performance of dauro millet. Maydica, 32: 287-299.

Le Clerg, E.L., W.H. Leonard and A.G. Clark, 1962. Field Plot Technique. 2nd Edn., Burgess Publishing Company, Illenois.

Maliwal, G.L., R.R. Patel, V.V. Sonali and G.V. Sasani, 1989. Effect of nitrogen, phosphorous and zinc on the yield and water use by pearlmillet under rainfed condition. Ind. J. Agric. Res., 23: 15-21.

Manjunath, B.L. and T.V. Muniyappa, 1990. Integrated weed management in drill sown finger millet (*Eleusine coracana*, Gaertn.). Indian J. Weed Sci., 22: 83-85.

Pareek, M. and M.S. Shaktawat, 1988. Effect of azospirillum, nitrogen and phosphorus on pearlmillet. Indian J. Agron., 33: 322-324.

Pearson, G.J., P.D. Coaldreke, M.J.T. Norman and Q.H. King, 1982. Evaluation of millet as a grain crop in Australia. Research Report, Department Agro. Heart Society, Sydney, Australia, pp: 1981-1982.

Prakash, V., J.P. Tandon and T.D. Sanwal, 1991. Comparative performance of soybean and finger millet based rotations under rainfed condition in UP Hills. Indian J. Agric. Res., 25: 102-106.

Rafey, A. and V.C. Srivastava, 1988. Effect of cultivation, seeding rate and spacing on grain-yield of rainfed fingermillet. Indian J. Agron., 33: 331-332.

Robinson, D.L., 1991. Yield, forage quality and nitrogen recovery rates of double cropped millet and ryegrass. Commun. Soil Sci. Plant Anal., 22: 713-727.

Sheshadri, T., A.P. Nagaraju, C.B. Kurdikeri, T.G. Shivappa, B.K. Ungegowda and M.A. Sinclachar, 1988. Response of rainfed ragi cultivars to nitrogen. Curr. Sci. Univ. Agric. Sci. Bangalore, 17: 90-92.