



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.23

TPI 2022; SP-11(2): 333-336

© 2022 TPI

www.thepharmajournal.com

Received: 04-12-2021

Accepted: 06-01-2022

SK Sharma

Project in Charge, Directorate of Research, ICAR-Network Project on Organic Farming, MPUAT, Udaipur, Rajasthan, India

Roshan Choudhary

CoPI, Directorate of Research, ICAR-Network Project on Organic Farming, MPUAT, Udaipur, Rajasthan, India

SK Yadav

Senior Research Fellow, Directorate of Research, ICAR-Network Project on Organic Farming, MPUAT, Udaipur, Rajasthan, India

RK Jain

Senior Research Fellow, Directorate of Research, ICAR-Network Project on Organic Farming, MPUAT, Udaipur, Rajasthan, India

Gajanand Jat

CoPI, Directorate of Research, ICAR-Network Project on Organic Farming, MPUAT, Udaipur, Rajasthan, India

RK Sharma

Assistant Professor, Dryland Farming Research Station, Arjia, Bhilwara, MPUAT, Udaipur, Rajasthan, India

Corresponding Author

SK Sharma

Project in Charge, Directorate of Research, ICAR-Network Project on Organic Farming, MPUAT, Udaipur, Rajasthan, India

Productivity and profitability of wheat varieties under organic farming in Southern Rajasthan

SK Sharma, Roshan Choudhary, SK Yadav, RK Jain, Gajanand Jat and RK Sharma

Abstract

The field experiment was conducted for six years during 2015-16 to 2020-21 at the Organic Farming Unit, MPUAT, Udaipur, Rajasthan, to evaluate the yield performance of different varieties of bread, durum and local wheat under sub-humid conditions of southern plains and Aravalli Hills of Rajasthan. Results revealed that among the 12 varieties of wheat tested under organic production system, the maximum grain yield (5704 kg/ha) was obtained from durum wheat variety HI-8713 followed by durum wheat variety HI-8663 (5007 kg/ha grain yield). Under organic farming, the durum wheat variety HI-8713 recorded maximum net profit of Rs. 164114/ha followed by durum wheat variety HI-8713 recorded net profit of Rs.137997/ha. The difference in yield of wheat varieties under organic farming ranged from 34.01 to 57.04 q/ha, with maximum of 57.04 q/ha in variety HI-8713 and the lowest of 34.01 q/ha in the variety HI-1500.

Keywords: organic, bread, durum, wheat inorganic, grain yield and net profit

Introduction

Organic agriculture comes across as a promising opportunity for farmers of India, especially the tribals, small and marginal farmers in the rainfed region or regions where traditional low input farming is practiced (Singh *et al.*, 2017)^[13].

Organically managed land differs substantially from their conventional counterparts for soil biodiversity, nitrogen level, soil moisture and retaining capacity, soil organic matter, weed intensity and types and biotic and abiotic stress. Aside from environmental stress, cultivars exhibit significant genetic variation among each other to respond any biotic and abiotic stress (Romagosa and Fox, 1993)^[11]. Therefore, several studies reported inconsistencies in crop and cultivar performance from one location to other (Peterson *et al.*, 1992; Barbari 2002; Entz 2001)^[10, 2, 5].

Selection of varieties for organic wheat production is not far different from the varieties selected for conventional production system. Hence, varieties that perform well in a region were selected. As the current high yielding varieties and hybrids are inadvertently selected for high input systems, they are likely to behave differently under organic conditions thus necessary field scrutiny, if grown organically. Wheat is the important crop of organic farming systems in India. However, 20-40% yield reduction in organic wheat have been observed in comparison to wheat grown with conventional farming (Sharma *et al.*, 2021)^[12]. Modern high yielding varieties which respond well to chemical inputs, may not be always suitable for organic farming (Yadav *et al.*, 2020; Murphy *et al.*, 2007)^[14, 8].

A great deal of confusion exists around the selection of a suitable variety of a crop for high yield under organic management as in case of chemical farming as selection of a variety under organic farming has a direct effect on yield and economics of a crop. The present investigation was carried out to compare yield and economics of different varieties of different types of wheat grown under organic farming.

Materials and Methods

The crop was grown in *Rabi* season during 2015-16 to 2020-21 at Organic Farming Unit, Rajasthan College of Agriculture, MPUAT, Udaipur (Rajasthan), India. Udaipur is located at 24.5568° N latitude, 73.7153° E longitude and altitude 582.17 m in the heart land of Aravalli Hills. The furrow slice (0-15 cm) soil of experimental site were clay loam with pH 8.1 (1:2 soil: water), medium organic carbon (0.55%), low in available N (220 kg ha⁻¹), high in available P (34.20 kg ha⁻¹), high in available K (235.50 kg ha⁻¹), 3.05 ppm available iron and 0.45 ppm available zinc.

Twelve varieties of different types of wheat (*Aestivum viz.*, HI-1531, MP-3288, Raj-3765, Raj-4037 and Raj-4120, *Durum viz.*, HI-8627, HI-8663, HI-8713, MPO-1215 and HI-1500 and *Local viz.*, Lol-1 and C-306) grown under organic farming as per Standards of National Programme on Organic Production (APEDA, 2019-20) [1]. The experiment was laid out in a randomized block design with three replications.

Statistical significance of treatment was tested at the 5% level of significance by using Analysis of Variance (ANOVA) METHOD (Gomez and Gomez, 1984) [6] for the RBD using R Studio software.

Results

Analysis of data of six-year study revealed that grain yield of different wheat varieties under organic farming varied from 3401 to 5704 kg/ha. Durum HI-8713 gave significantly higher grain, straw and harvest index (5704 kg/ha, 9588 kg/ha and 37.27, respectively) as compared to other varieties. Among bread wheat varieties, variety MP-3288 was found superior in comparison to variety HI-1531, Raj-4037, Raj-4120 and Raj-3765. Similarly, among durum wheat varieties, variety HI-8713 recorded the maximum yield. The yield of local wheat variety C-306 was found superior over local wheat variety Lok-1.

The variety HI-8713 recorded significantly higher number of grains/ ear and test weight in comparison to other varieties which resulted the higher yield of this variety in comparison to other varieties.

Straw yield of wheat was recorded higher in the wheat durum variety HI-8713 followed by HI-8627, HI-1531 and C-306. This might be attributed to significantly LAI and dry matter accumulation of variety HI-8713 in comparison to the other varieties. Grain yield differences due to varieties were also

reported by Biswas *et al.* (1998) [4]. Iannucci and Codianni (2016) [7] evaluated durum wheat varieties for conventional and low input organic conditions based on variability in yield attributes and yield. Different varieties in different environments and breeding may contribute to the improvement of yield and baking quality to a certain extent (Baresel *et al.* 2008) [3].

No significant difference in the harvest index of different varieties of wheat.

Variety HI-8713 of durum wheat recorded significantly higher net return and benefit-cost ratio (B:C ratio) (166414 Rs /ha net return and 3.56, respectively) as compared to other varieties. The net return and B:C ratio of durum varieties was comparatively higher than bread and local varieties (Table 2). Ozberk *et al.* (2011) [9] also reported the better net return and B:C ratio of durum wheat as compared to other varieties. This might be due to higher test weight of durum wheat varieties than bread wheat varieties. Highly significant correlation coefficient between 1000 kernel weights vs. marketing price as indicated earlier visual characteristics of grains in commodity market are main criteria for high market price offers. Hence, the present study reveals that the performance of durum variety in terms of productivity and profitability is significantly better than the bread varieties under organic production system. Durum variety HI-8713 produced significantly higher grain yield (>5 t ha⁻¹) and straw yield (9.5 t ha⁻¹) by registering higher values of growth and yield attributes. Under organic farming, durum variety HI-8713 followed by HI-8663 recorded the higher net return of more than ₹ 1.30 lakh ha⁻¹ and also B:C ratio more than 3.0. Thus, it can be concluded that according to prevailing cropping system, durum variety HI-8713 can be promoted for organic cultivation in Southern region of Rajasthan.

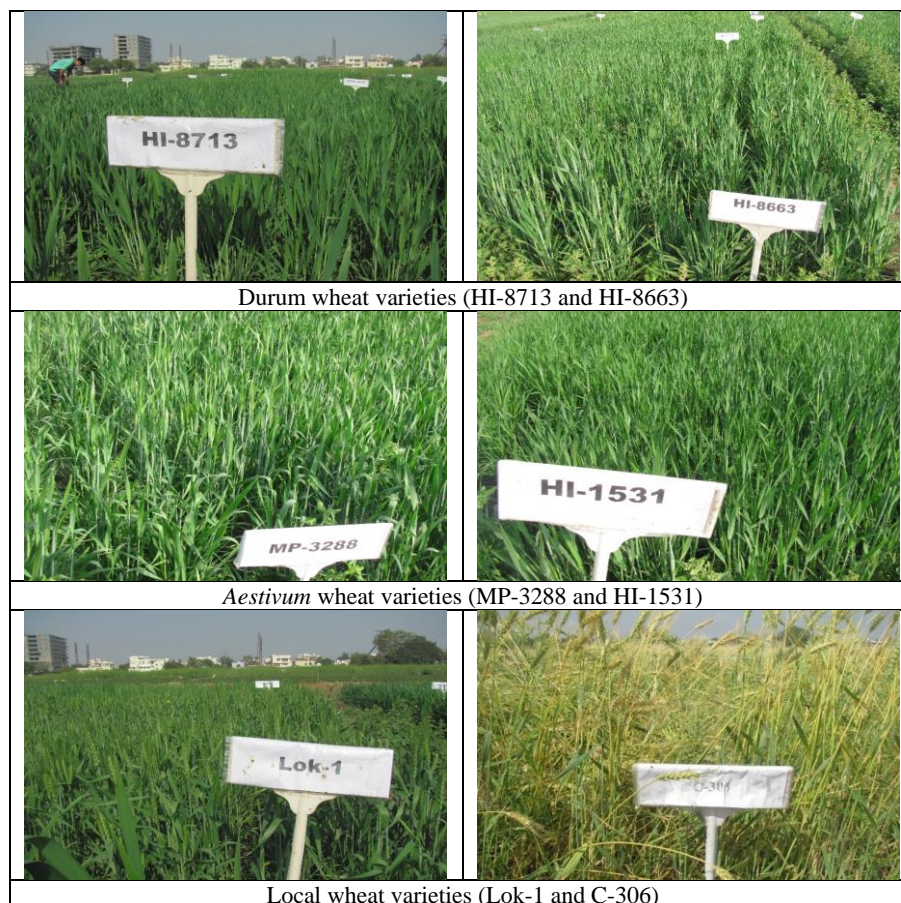


Fig 1: Field performance of different varieties of wheat under organic farming

Table 1: Effect of different varieties of wheat on yield and economics grown under organic farming (Mean of six years)

Varieties	Grain yield (kg/ha)							Straw yield (kg/ha)							Harvest index (%)						
	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Mean	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Mean	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Mean
HI-1531	4407	4296	4504	4130	4320	4295	4325	7630	8481	8748	8500	6048	6210	7603	36.67	34.32	33.98	32.7	41.67	40.89	36.71
MP-3288	4333	4815	4626	4460	4585	4615	4572	7241	6852	9075	8750	7336	7400	7776	37.58	41.93	33.71	33.76	38.46	38.41	37.31
Raj-3765	3111	4111	3452	3350	3500	3480	3501	6519	7556	6743	6845	6300	6450	6736	32.27	36.95	33.79	32.86	35.71	35.05	34.44
Raj-4037	3380	4407	4121	4055	4000	4080	4007	7361	8000	7519	7425	5600	5700	6934	31.98	36.14	35.38	35.32	41.67	41.72	37.04
Raj-4120	2991	3741	3435	3545	3620	3700	3505	6454	8111	6662	6780	6407	6520	6822	32.02	31.62	34.21	34.33	36.1	36.20	34.08
HI-8627	4241	4648	4518	4460	4490	4410	4461	7611	9056	8509	8870	8082	8210	8390	35.72	35.61	34.66	33.46	35.71	34.94	35.02
HI-8663	3824	5185	5024	5250	5360	5400	5007	6917	8148	8986	9415	8307	8522	8383	35.74	38.66	35.87	35.8	39.22	38.79	37.35
HI-8713	4481	6796	5424	5900	5840	5785	5704	8111	10426	9447	10700	9341	9500	9588	35.33	39.92	36.47	35.54	38.48	37.85	37.27
MPO-1215	3339	4500	4245	4155	4300	4320	4143	5920	6611	8513	8425	6704	6815	7165	36.4	41.42	33.27	33.03	39.06	38.80	37.00
HI-1500	2926	3537	3431	3350	3555	3605	3401	7259	7574	7405	7500	5688	5750	6863	28.9	31.74	31.79	30.88	38.46	38.54	33.39
Lok-1	2981	3704	3547	3450	3730	3680	3515	6648	7037	6802	6715	6341	6520	6677	30.88	37.03	34.33	33.94	37.04	36.08	34.88
C-306	4278	4278	4233	4000	4175	4210	4196	7389	7981	8081	7685	6263	6135	7256	37.11	36.47	34.38	34.23	40	40.70	37.15
S.Em ±	3.10	4.49	142.8	141.98	146.91	146.67	142.37	6.485	12.172	301.5	270.082	233.84	241.37	253.75	2.22	5.09	1.062	1.18	0.23	1.31	1.25
CD at 5%	9.09	13.16	418.7	416.41	430.87	430.18	417.54	19.020	35.698	884.36	792.123	685.83	707.93	744.22	6.50	14.93	3.113	3.46	0.66	3.84	3.66

Table 2: Gross return, net return and B: C ratio of different varieties under organic farming during 2015-16 to 2020-21

Varieties	Gross return (Rs. /ha)							Net return (Rs. /ha)							Net return per rupee invested						
	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Mean	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Mean	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Mean
HI-1531	162319	163552	170717	136760	158544	158710	158434	116583	117816	124981	91024	111544	113090	112506	2.55	2.58	2.73	1.99	2.37	2.48	2.45
MP-3288	158261	169759	175801	145370	173313	174535	166173	112525	124023	130065	99634	126313	128915	120246	2.46	2.71	2.84	2.18	2.69	2.83	2.62
Raj-3765	120356	153644	131034	110663	136150	136395	131374	74620	107908	85298	64927	89150	90775	85446	1.63	2.36	1.87	1.42	1.9	1.99	1.86
Raj-4037	132171	164207	153742	129305	146800	149670	145983	86435	118471	108006	83569	99800	104050	100055	1.89	2.59	2.36	1.83	2.12	2.28	2.18
Raj-4120	116655	146107	130166	114602	140221	143160	131819	70919	100371	84430	68866	93221	97540	85891	1.55	2.19	1.85	1.51	1.98	2.14	1.87
HI-8627	166039	185628	169911	146018	174661	173045	169217	120303	139892	124175	100282	127661	126425	123123	2.63	3.06	2.72	2.19	2.72	2.71	2.67
HI-8663	149997	197111	186508	166341	201116	203471	184091	104261	151375	140772	120605	154116	156851	137997	2.28	3.31	3.08	2.64	3.28	3.36	2.99
HI-8713	175811	257061	200043	187580	220736	220015	210208	130075	211325	154307	141844	173736	173395	164114	2.84	4.62	3.37	3.1	3.7	3.72	3.56
MPO-1215	130361	168717	162278	136905	161571	162763	153766	84625	122981	116542	91169	114571	116143	107672	1.85	2.69	2.55	1.99	2.44	2.49	2.34
HI-1500	124800	144739	133842	114200	134379	136170	131355	79064	99003	88106	68464	87379	89550	85261	1.73	2.16	1.93	1.5	1.86	1.92	1.85
Lok-1	117387	139593	133996	112161	143046	142580	131461	71651	93857	88260	66425	96046	97460	85617	1.57	2.05	1.93	1.45	2.04	2.16	1.87
C-306	157461	160483	159749	129499	155519	155833	153091	111725	114747	114013	83763	108519	110713	107247	2.44	2.51	2.49	1.83	2.31	2.45	2.34
S.Em ±	10722.73	10682.75	4511.45	4598.32	5498.36	5578.66	5261.53	10722.73	10682.75	4511.45	4598.32	5498.36	5578.66	3688.61	0.23	0.23	0.10	0.07	0.12	0.12	0.08
CD at 5%	31448.69	31331.42	13231.64	13486.4	16126.14	16361.65	15431.54	31448.69	31331.42	13231.64	13486.4	16126.14	16361.65	10818.33	0.69	0.69	0.29	0.19	0.34	0.36	0.24

Conclusion

It may be concluded from the research study that durum wheat variety HI-8713 recorded significantly maximum grain yield (5704 kg/ha), net return (₹ 164114/ha) and BC ratio (3.56) among different varieties of wheat grown under organic production system on pooled basis (2015-16 to 2020-21).

Acknowledgements

We acknowledge the financial support of ICAR- All India Network Project on Organic Farming, Indian Institute of Farming System Research, Modipuram, Meerut, India for this study.

References

1. APEDA, 2019-20. www.apeda.gov.in
2. Barbari P. Weed management in organic agriculture: Are we addressing the right issues? *Weed Research*. 2002;42:177-193.
3. Baresel JP, Zimmermann G, Reents HJ. Effects of genotypes and environment on N uptake and N partition in organically grown winter wheat (*Triticum aestivum* L.) in Germany. *Euphytica*. 2008;163:347-354.
4. Biswas J, Hossain W, Sarker MA, Hansan BC, Haque MZ. Yield performance of several rice varieties seeded directly as late *aman* crops. *Bangladesh Journal of Life Science*. 1998;10(1, 2):47-52.
5. Entz MH, Guilford R, Gulden R. Crop yield and soil nutrient status on 14 organic farms in the eastern portion of the northern great plains. *Canadian Journal of Plant Science*. 2001;81:351-354.
6. Gomez KA, Gomez AA. *Statistical procedures for agricultural research*. 2nd ed. New York, NY: John Wiley & Sons, 1984.
7. Iannucci A, Codianni P. Effects of conventional and organic farming systems on bio-agronomic and quality traits of durum wheat under Mediterranean conditions. *Australian Journal of Crop Science*. 2016;10(8):1083-1091.
8. Murphy KM, Campbell KG, Lyon SR, Jones SS. Evidence of varietal adaptation to organic farming systems. *Field Crops Research*. 2007;102:172-177.
9. Ozberk I, Kılıç H, Ozberk F, Atli A, Karli B, Coskun Y. Variety selection based on net return per hectare in durum wheat (*T. durum* L.), *African Journal of Agriculture Research*. 2011;6(4):1016-1024.
10. Peterson CJ, Graybosch RA, Baenziger PS, Grombacher AW. Genotype and environment effects on quality characteristics of hard red winter wheat. *Crop Science*. 38, 98-103.
11. Romagosa I, Fox PN. Genotype × environment interaction and adaptation. In: Hayward, M.D., Bosemark, N.O., Romagosa, I. (Eds.), *Plant Breeding: Principles and Prospects*. Chapman & Hall, London, 1993, 373-390.
12. Sharma SK, Ravishankar N, Chander M, Jat G, Choudhary R, Fagodiya RK, *et al.* Organic agriculture under changing climate scenario, *Indian Journal of Agronomy* (5th IAC Special issue). 2021;66:S82-S94.
13. Singh DK, Shilpi G, Sharma Y, Singh VV. Organic farming: Way for social and nutritional security of small and marginal farmers of Uttarakhand. In: *Sovenier and abstracts of international conference on technological advancement for sustainable agriculture and rural*

development held during. 2017 Feb 20-22, 104-105.

14. Yadav SK, Sharma SK, Choudhary R, Jain RK, Jat G. Yield performance and economics of wheat varieties under organic farming. *Indian Journal of Agricultural Sciences*. 2020;90(11):2225-32.