Asian Journal of Plant Sciences

ISSN 1682-3974

science alert

ANSInet
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Asian Journal of Plant Sciences
Volume 1 Number 2: 148-150, 2002

Yield and Yield Components of Different Cultivars of Wheat Barley and Oat Under Rainfed Conditions

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Abstract: A field experiment was conducted to study yield and yield components of different cultivars of wheat, barley and oat under rainfed conditions. Statistical analysis of the data revealed that days to emergence, number of leaves tillers^{-1}, number of tillers plant^{-1}, number of spikes plant^{-1}, spikes m^{-2}, grains spike^{-1}, days to heading, thousand grains weight, days to maturity, grain weight and biological yield was significantly affected by different cultivars of wheat, barley and oat. Mean value of the data indicated that those plots which were seeded with full green (oat) produced taller plants and more spikes plant^{-1}. Similarly, fork deer (oat) gave more grains spike^{-1} and biological yield. Dir local (barley) produced maximum thousand-grains weight. Mean value of the data also indicated that maximum grain yield was produced by avon (oat). When cost benefit ratio was taken into an account Inqualib-91 gave maximum net profit when compared with other crops under study.

Key words: Yield, yield components, wheat, barley, oat

Introduction

Cereal crops play an important role in the agricultural system of Pakistan but its grain yield ha^{-1} in Pakistan is much less compared to other cereal producing countries of the world. Various factors are considered responsible for better crop harvest among which high potential varities offer a tremendous scope. Bhateja *et al.* (1991) evaluated sixty-four barley genotypes, among which four genotypes were found suitable for both rainfed and irrigated conditions. Bakele *et al.* (1992) reported significant cultivars and location differences for grain yield, biological yield and harvest index of wheat. (Baber *et al.*, 1992). Different varieties of cereals respond differently to agro climatic conditions of a particular area due to difference in their genetic make up and physical life process. (Behera, 1994). Selection of improved and high yield genotypes of different cereals having a wide range of adaptation to agro climatic conditions is essential to increase the yield ha^{-1} . Lopez and Richards (1994) compared the relative performance of barley, bread wheat, durum wheat, triticale and oats in rainfed environments and from that barley had 25% higher grain yield than the other species when averaged over all cultivars.

Due to the importance of cereals in the agrarian economy of Pakistan, the present research project was initiated to study the performance of different cereals under rainfed conditions.

Materials and Methods

In order to study yield and yield components of different cereals under rainfed conditions, an experiment was conducted at Malakandher Research Farms, NWFP Agricultural University Peshawar during 1999-2000. The experiment was laid out in randomized complete block (RCB) design. Standard agronomic practices were followed through out the growing season. The following crops and their varieties were studied during the experiment.

List of cultivars

Wheat		Barley		Oat	
a	Tatara-96	a	PRB-12	a	Full green
b	Inqilab-91	b	Dir-local	b	Avon
c	Bakhtawar-92	c	Peshawar-local	c	Fork deer

Data was recorded on the following parameters during the course of study, days to emergence, number of leaves tillers^{-1}, number of tillers plant^{-1}, number of tillers m^{-2}, number of spikes m^{-2}, number of grains spikes^{-1}, days to heading, thousand grain weight, plant height (maturity stage), days to maturity, grain yield (kg ha^{-1}), biological yield (kg ha^{-1}), cost benefit ratio (Rs). Days to emergence were recorded by counting the number of days taken by the plant from the date of sowing till the completion of germination. Number of leaves tiller^{-1} was recorded by counting the number of leaves of five randomly selected plants in each sub plot and then averaged. Number of tillers m^{-2} and number of spikes m^{-2} was recorded by counting the number of tillers in one meter length area of the three central rows in each subplot and their mean was then calculated. For calculating number of grains spike^{-1}, five spikes treatment were randomly selected in each subplot and then their grains were counted and divided by 5 to get the average grains spike^{-1}. Days to heading were counted from the date of emergence till the appearance of spikes in each subplot. Thousand grains weight data was recorded by weighing one thousand grains from each subplot with an electronic balance and then their mean was calculated. Plant height was recorded by measuring five different plants of variable height in different rows in each subplot with measuring tape and then their average height was calculated in each treatment. Days to maturity were recorded when 90% plants in each treatment were matured. The data recorded for grain yield in each subplot was converted into grains yield ha^{-1} by using the relevant formulae:

Grain yield (kg ha^{-1}) = Yield subplot^{-1} x 10000/unit area.
Biological yield (kg ha^{-1}) = Yield subplot^{-1} x 10000/unit area.

The data was statistically analyzed according to RCB design and upon obtaining significant difference; least significant difference (LSD) test was employed for treatment comparison.

Results and Discussion

Statistical analysis of the data revealed that days to emergence was significantly ($P<0.05$) affected by various cultivars of wheat, barley and oat. Mean values of the data (Table 1) indicated that maximum of 16 days to emergence were taken by barley (Peshawar-local) followed by tatara- 96 (wheat) which took 15 days to emergence while minimum days to emergence (12 days) were taken by avon (oat). This variation could be due to genetic make up of different cultivars under study (Leonard and Martin, 1963). Data also presents number of leaves tiller^{-1} of wheat, barley and oat. Statistical analysis of the data indicated that number of leaves tiller^{-1} was significantly ($P<0.05$) affected by various cultivars of wheat, barley and oat. It can be seen from the data (Table 1) that maximum of 6 leaves tiller^{-1} were produced by oat (full green) while minimum number of leaves tiller^{-1} (3) were recorded by plots sown with Dir-local and Tatara-96 (wheat). Bhatti *et al.* (1992) reported that different cultivars produced different number of leaves due to variation in their genetic makeup. Mean value of the data revealed that number of tillers plant^{-1} was significantly ($P<0.05$) affected by various cultivars of wheat, barley and oat. Maximum of 11.75 tillers plant^{-1} were produced by PRB-12 followed by Dir-local (barley) which produced 11.00 tillers plant^{-1}, while minimum tillers plant^{-1} were produced by Bakhtawar-92 followed by Tuatara -96 (wheat). These results are in agreement with those reported by Khan and Saleem (1986). Statistical analysis of the data showed that spikes $^{-}$was significantly ($P<0.05$) affected by various cultivars of wheat, barley and oat. It can be inferred from the data (Table 1) that maximum number of 267 spikes m^{-2} was produced by Full green followed by Avon (oat) which produced 245 spikes. m^{-2}, while minimum of 156 spikes m^{-2} was produced by Bakhtawar-92 followed by Tatara-96 (wheat) which produced 157 spikes. m^{-2}. Analysis of the data revealed that grains spike^{-1} was significantly ($P<0.05$) affected by various cultivars of wheat, barley and oat (Table 2). It can be inferred that maximum number of 70 grains spike^{-1} was produced by fork deer followed by avon (oat) which produced 60 grains

Table 1: Days to emergence, number of leaves tiller^{-1}, number of spikes m^{-2} and number of tillers plant^{-1} as affected by different cultivars of wheat, barley and oat

Crops	Treatments	Days to emergence	Number of leaves tiller	Number of tillers plant^{-1}	Number of spikes m^{-2}
Wheat	Tatara-96	15ab	3.00c	6.50d	157.00g
	Inqilab-91	13cd	5.00ab	9.75ab	185.00e
	Bakhtawar-92	14bc	4.00bc	6.00d	156.00g
Barley	PRB-12	13cd	4.00bc	11.75a	201.00d
	Dir local	13cd	3.00c	11.00ab	168.00f
	Peshawar local	16a	4.25bc	7.25cd	230.00c
Oat	Full green	12d	6.00a	8.50bad	267.00a
	Avon	14bc	4.00bc	8.50bad	245.00b
	Fork deer	13cd	4.25bc	9.00abed	229.00c
	LSD (0.05) =	1.97	1.28	3.11	5.10

Table 2: Number of grains spike^{-1} , days to heading, 1000 grain weight (g) and plant height (cm) affected by different cultivars of wheat, barley and oat

Crops	Treatments	Number of grains spike^{-1}	Days to heading	1000 grain weight	Plant height
Wheat	Tatara-96	49.00de	107de	35.00b	92.00e
	Inqilab-91	56.00bc	108cd	40.00a	87.00f
	Bakhtawar-92	52.00cd	106ef	33.08c	80.00g
Barley	PRB-12	47.50e	105f	35.00b	90.00ef
	Dir local	56.00bc	110b	40.50a	110.00c
	Peshawar local	36.00g	107de	33.50bc	100.75d
Oat	Full green	50.00de	113a	20.25f	110.00c
	Avon	60.00b	108cd	24.62d	119.00b
	Fork deer	70.00a	109bc	22.18e	125.00a
	LSD (0.05) =	4.44	1.45	1.65	3.29

Table 3: Days to maturity, grain yield (kg ha^{-1})and biological yield (kg ha^{-1})as. affected by different cultivars of wheat ,barley and oat

Crops	Treatments	Days to maturity	Grain yield	Biological yield (kg ha^{-1})
Wheat	Tatara-96	171bc	3333.33ab	10138.77e
	Inqilab-91	170c	3239.58ab	11145.83de
	Bakhtawar-92	172bc	2795.14bc	11232.63de
Barley	PRB-12	160c	3333.33ab	11666.66cd
	Dir local	162e	2361.11c	11111.10de
	Peshawar local	165d	2708.33bc	11250.00de
Oat	Full green	175a	3402.77ab	12569.44c
	Avon	173ab	3611.11a	14305.55b
	Fork deer	173ab	3194.44b	15694.44a
	LSD (0.05) =	2.45	707.46	1236.21

Mean in the vertical columns followed by different letters are significantly different at $P < 0.05$, using LSD test

spike^{-1}. While minimum grains spike^{-1} were recorded from those plots which were sown with PRB-12 (barley). Similar results are also reported by Khan (1983). Ana by Bakhtawar-92 followed by Tatara-96 (wheat) which produced 157 spikes. m^{-2}. Data concerning grains spike^{-1} of lysis of the data indicated that various cultivars of wheat, barley and oat had a significant ($P < 0.05$) effect on days to heading (Table 2). It is clear from the data that maximum of 113 days to heading (13) were taken by those plots which were sown with oat (full green) followed by barley (Dir-local) which took 110 days to heading. Similarly, minimum days to heading (105) were taken by PRB-12 (barley). Analysis of the data revealed that thousand-grain weight was significantly ($P < 0.05$) affected by various cultivars of wheat, barley and oat (Table 1). It can be seen from the data (Table 2). that maximum grain weight of 40.50 g1000 grains^{-1} was produced by Dir-local (barley) followed by Inqilab (wheat). While minimum 1000 grain weight was recorded in those plots, which were sown with full green (oat). These results agree with those of Razzaq *et al.* (1986) and Zeb *et al.* (1987). Statistical analysis of the data revealed that different cultivars of wheat, barley and oat had a significant ($P < 0.05$) effect on plant height (Table 2). Mean values of the data (Table 2) indicated that taller plants (125) cm were attained by oat (fork deer) followed by avon (oat) which attained plant height of 119 cm, while smaller plants (80) cm were produced by Bakhtawar-92 (wheat). Ashiq *et al.* (1995) reported that the difference in plant height might be due to the difference in their genetic makeup. Statistical analysis of the data indicated that days to maturity were significantly ($P < 0.05$) affected by various cultivars of wheat, barley and oat (Table 3). It can be inferred from the data (Table 3) that maximum of 175 days to maturity were taken by oat (full green) which was at per with fork deer and avon (oat). While minimum days to maturity (160

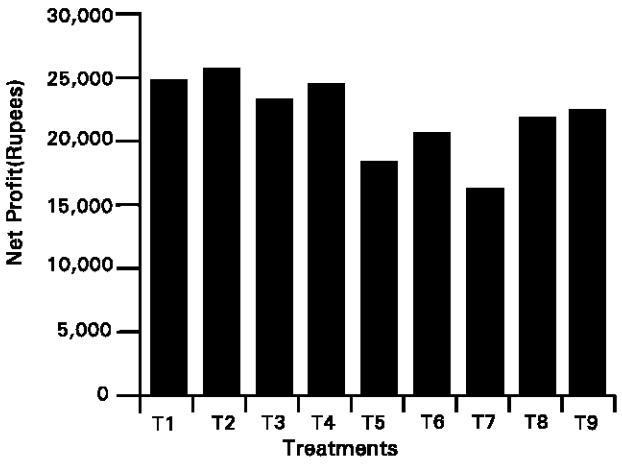

Fig. 1: Net profit of different cultivars of wheat, barley and oat under rainfed condition

T1	=	Tatara-96	T6	=	Peshawar local
T2	=	Inqilab-91	T7	=	Full green
T3	=	Bakhtawar-92	T8	=	Avon
T4	=	PRB-12	T9	=	Fork deer
T5	=	Dir local			

and 162) were taken by PRB-12 and Dir local (barley), respectively. Leonard and Martin (1963). Mean value of the data showed that grains yield was significantly ($P<0.05$) affected by various cultivars of wheat, barley and oat (Table 3). It can be inferred from the data (Table 3) that maximum grains yield of 3611 Kg ha^{-1} was obtained by Avon (oat) followed by Full green (oat) and PRB-12 (barley) which produced grains yield 3403 and 3333 kg ha^{-1}, while minimum grains yield (2361 kg ha^{-1}) was produced by Dir-local (barley). Similar results are also reported by Farnsworth and Williams (1977) and Mohammad *et al.* (1992), but contrary to those reported by Lopez and Richard (1994). Statistical analysis of the data revealed that biological yield was significantly ($P<0.05$) affected by various cultivars of wheat, barley and oat. The maximum biological yield of 15694 Kg ha^{-1} was produced by oat (fork deer) followed by (Avon) which produced biological yield of 14305 kg ha^{-1}, while minimum biological yield of 10139 kg ha^{-1} was recorded by Tatara-96 (wheat) (Table 3). Similar results were also reported by Koler and Khristov (1984). Data regarding cost benefit ratio is presented in Fig. 1.The plots sown with Inqualib-91(wheat) resulted in maximum net profit followed by plots seeded with Tatara-96. It can be also inferred from the Fig. 1 that net profit was minimum full green (oat) when compared with other treatments.

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