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Effect of different fertilizers (Organic and Inorganic) on the yield components of Rice (*Oryza sativa* L.)

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Abstract

An experiment was conducted at farm of Mr. Balraj Singh, village Kabarwala, Teh. Malout, Dist. Shri Muktsar Sahib (Punjab) during the year 2018 to study the effect of different fertilizers (Organic and Inorganic) on the yield components of Rice (*Oryza sativa* L.). The treatments were: A) Main plot, (varieties) V₁- Variety Pusa Basmati 1121, V₂- Variety Pusa Basmati 1509, B) Sub plot (different fertilizers), F₁- FYM, F₂- Urea + SSP, F₃- FYM + Urea + SSP. The effect of these factors on plant height, dry matter accumulation, total tillers per hill, length of panicle, weight of panicle, number of grains per panicle, 1000 grain weight, yield and harvesting index were observed. The experiment concluded that among the varieties V₁ (Basmati 1121) had more plant height, dry matter, number of tillers and length of panicle than V₂ in the combined use of FYM + Urea + SSP and V₂ (Basmati 1509) had more grains per panicle, weight of panicle, test weight and yield than V₁ in the same use of fertilizers (FYM + Urea + SSP). So it can be concluded that combined application of fertilizers (FYM + Urea + SSP) gives more yield in V₂ (Basmati 1509) as compared to other treatments.

Keywords: Spacing, Broadcast, Bi-directional, Spacing, Wheat

Introduction

Rice belongs to poaceae/Gramineae family. The kingdom of rice is plantae. The genus of Rice is *Oryza* and *sativa* is species, class is Liliopsida. Rice is a crop of global significance. It is a staple food crop of 60 percent of world's population. Rice covers world's largest area (28%) covering 42.3 million hectares with a total production of 80 million tonnes annually. Mostly it is cooked with water. Other edible uses include rice flakes and puffed rice, rice wafers and canned rice. It is also used starch and brewing industries. The byproduct of rice milling i.e., rice husk and bran are used as a cattle and poultry feed (agropedia.iitk.in)^[1]. The rice plant can grow to 1–1.8 m (3.3–5.9 ft) tall, occasionally more depending on the variety and soil fertility. It has long, slender leaves 50–100 cm (20–39 in) long and 2–2.5 cm (0.79–0.98 in) broad. The small wind-pollinated flowers are produced in a branched arching to pendulous inflorescence 30–50 cm (12–20 in) long. The edible seed is a grain (caryopsis) 5-12 mm (0.20-0.47) in long and 2-3 (0.079- 0.118) in thick (www.wikipedia.org)^[2]. Among the means available to achieve sustainability in agricultural production, organic manure and bio-fertilizer which play an important and key role because they possesses many desirable soil properties and exerts beneficial effects on the soil physical, chemical and biological characteristics. However the most optimum organic and bio-fertilizers doses as well as their effectiveness for upland crops have not been studied in details. In this regard an attempt has been made to study the influence of organic and bio-fertilizers in relation to chemical fertilizers on rice production (Farah *et al.* 2014)^[3].

Material and Methods

The experiment was carried out at the farm of Mr. Balraj Singh, village Kabarwala, Teh. Malout, Dist. Shri Muktsar Sahib (Punjab) during the Kharif season of 2018-19. The experiment was conducted in 6 plots with having dimensions 5X5 m (25 m²). The treatments were A) Main plot, (varieties) V₁- Variety Pusa Basmati 1121, V₂- Variety Pusa Basmati 1509,

B) Sub plot (different fertilizers), F₁- FYM, F₂- Urea + SSP, F₃- FYM + Urea + SSP. The land was tilled once with the help of disc harrow to make it free from weeds and twice by cultivator followed by planking to make a fine seed bed. The puddling was done before transplanting. About 2-2.5 kg seeds were used to sow one Marla of nursery. One Marla of healthy seedlings are sufficient for the transplanting in one acre. The seeds were treated with Carbendazim 50 EC @ 1 g kg⁻¹ of seed. Pure and healthy seeds were taken for the nursery raising. Seeds were soaked in water for 24 hours. Date of sowing and transplanting for varieties are:

Date of sowing

PB-1121 - 3-June-2018
Pb-1509 - 3-June-2018

Date of transplanting

PB-1121 - 2-July-2018
PB-1509 - 2-July-2018

About 17 t/ha of FYM was applied 10 days before the field preparation. 110 Kg of urea acre⁻¹ and SSP @ 75 kg acre⁻¹ was broadcasted in three equal splits, the first dose was applied at 29th July, second dose was applied at 10th August and third one at 26th August. Plant height was measured by using measuring tape from ground surface to the top most leaf of the plant. It was firstly done after 15 days of transplanting and afterwards at an interval of 15 days till harvesting. Five plants were selected randomly from each plot and had been measured. Dry matter of plant was calculated from ground level to the top of the plant. Then the plant has been kept in oven at 60^oc for 72 hours. It was firstly done after 15 days and afterwards at an interval of 15 days till harvesting. Total tiller per hill counted after 30 days of transplanting and afterwards at an interval of 30 days till harvesting. Length of panicle has been observed at the time of harvesting with the help of measuring tape. Weight of panicle has been observed at the time of harvesting with the help of weighting machine. The average number of grains per panicle was counted from randomly selected five plants from each plot at the time of harvesting. After harvesting 1000-grains were collected and weighted with the help of weighing machine. The yield per acre was measured after the harvesting. Harvest index was calculated after the harvesting. Harvest index was calculated by dividing the economic yield by biological yield multiplied by 100.

Treatments

A) Main plot (varieties)

V₁- Variety Pusa Basmati 1121
V₂- Variety Pusa Basmati 1509

B) Sub plot (different fertilizers)

F₁- FYM
F₂- Urea + SSP
F₃- FYM + Urea + SSP

Results and Discussions

Plant height (cm)

As from the experiment, after the 60 days of transplanting the maximum plant height (99.49cm) was found in V₁. At the harvesting stage maximum plant height (119.65cm) is observed in V₁ and average plant height (102.7cm) was found in V₂. Similarly, after 60 days of transplanting maximum plant

height (101.3cm) was found in V₁T₃ and minimum plant height (95.3cm) was observed in V₂T₁. At the harvesting time maximum plant height (125.06cm) was found in V₁T₃ and minimum plant height (101.2cm) was observed in V₂T₁. So, Sarkar *et al.* [4] concluded that the highest plant height (149.9 cm) were recorded in BRR dhan34 by using the 75% of recommended dose of inorganic fertilizers + 50% of cow dung followed by plant height (149.7 cm) was recorded in BRR dhan34 by the application of 75% of recommended dose of inorganic fertilizers + 50% poultry manure. The minimum plant height (110.1 cm) recorded in BRR dhan37 with no any fertilizers use (control). Similarly, Arif *et al.* [5] showed that the application of organic and inorganic manures increased the plant height significantly over control. Maximum plant height (131.34 cm) was observed in plots where RDF (150-90-60 NPK kg/ha) was applied. Minimum plant height (94.59 cm) was recorded in control.

Number of tillers per hill/plant

It was observed that maximum number of tillers (21.3) from V₁ at the harvesting time and minimum (19.6) was found in V₂. Similarly, maximum tillers per hill (23) were found in V₁T₃ and minimum (18) was found in V₂T₁. So, Mahmud *et al.* [6] observed that the maximum number of effective tillers per hill (15.3) was recorded in rice by the application of 4 t ha⁻¹ vermicompost and 100-16-66-12 kg ha⁻¹ NPKS respectively followed by number of effective tillers (14.97) was recorded in rice by the using the 2 t/ha and 150-24-99-18 kg ha⁻¹ NPKS). Minimum number of effective tiller (10.50) was recorded in control. Similarly, Aulakh *et al.* [7] concluded that maximum number of effective tiller/m² (233.5) was recorded in T₇ (FYM + 50% RN) followed by T₈ (228.5) by the application of farmyard manure and green manure. Minimum number of effective tiller/m² (175.5) was recorded in T₉ (control).

1000 grain weight (gm)

It was observed that maximum 1000 grains weight (33.0 g) was found in V₂ and minimum (31.7 g) was found in V₁. Similarly, the maximum 1000 grain weight (35.9 g) was found in V₂T₃ and minimum (28.8 g) was found in V₁ when FYM was applied. So, Farah *et al.* [3] concluded that Maximum 1000-grain weight (29.70 g) was recorded in Kosti 1 by the application of urea + sup + comp in 2010-11 but maximum 1000-grain weight (26.80 g) was recorded in Kosti 1 by the application of Em in 2011-12. Minimum 1000-grain weight (20.20 g) was observed in Omgar by the application of compost in 2010-11 but minimum 1000-grain weight (17.88g) was recorded by the application of EM in Omgar in 2011-12. Similarly, Shahi *et al.* [8] observed that maximum 1000-grain weight (32.85 g) was recorded by using the SSNM + K followed by 31.86 g by the application of SSNM. Minimum 1000-grain weight (28.45 g) was recorded by the application of 100% NP.

Yield per acre

As from the experiment it was observed that maximum grain yield (19.50 q/acre) was found in V₂ and minimum (19.18 q/acre) was observed in V₁ variety. The effect of different fertilizers on grains yield was varied. The maximum grain yield (21.13 q/acre) was found in T₃ and minimum grain yield (16.62 q/acre) was found when FYM was used. So, Singh *et al.* [9] concluded that highest grain yield (47.5 and 50.2 q/ha) was recorded in HB-2 followed by PB-1121 (47.1 and 47.0

q/ha), PB-1 (43.9 and 44.6 q/ha) and PB-1509 (42.9 and 43.8 q/ha) under direct seeding conditions. Similarly, Koushal *et al.* ^[10] observed that the highest grain yield (42.44 q/ha) was recorded in treatment T₄ by the application of 100% RDF in 2006-07. The highest grain yield (45.47 t/ha) was observed in

T₇ (50% RDF + 50% through vermicompost) in 2007-08. Minimum grain yield (21.84 and 21.52 q/ha) was recorded in control measures in 2006-07 and 2007-08.

Observations and Tables

Table 1: Periodic plant height (cm) of basmati rice as affected by different fertilizer and varieties.

Varieties	V ₁ -1121			V ₂ -1509		
	T ₁	T ₂	T ₃	T ₁	T ₂	T ₃
15 DAS	35.38	37.70	38.70	34.91	36.00	37.52
30 DAS	63.78	65.82	65.72	62.42	64.38	65.02
45 DAS	81.40	83.74	84.58	80.40	84.48	83.36
60 DAS	96.28	100.92	101.30	95.33	97.60	98.62
75 DAS	103.40	110.20	110.00	99.30	100.30	101.80
90 DAS	106.60	117.56	118.70	101.20	102.80	104.10
105 DAS	108.24	121.02	122.36			
At harvest	110.50	123.40	125.06			

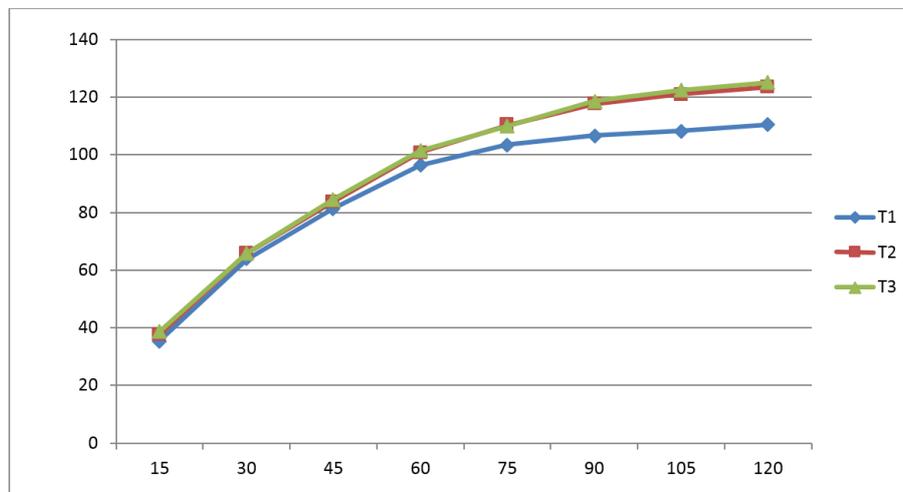


Fig 1: Effect of different fertilizers on plant height of basmati rice 1121.

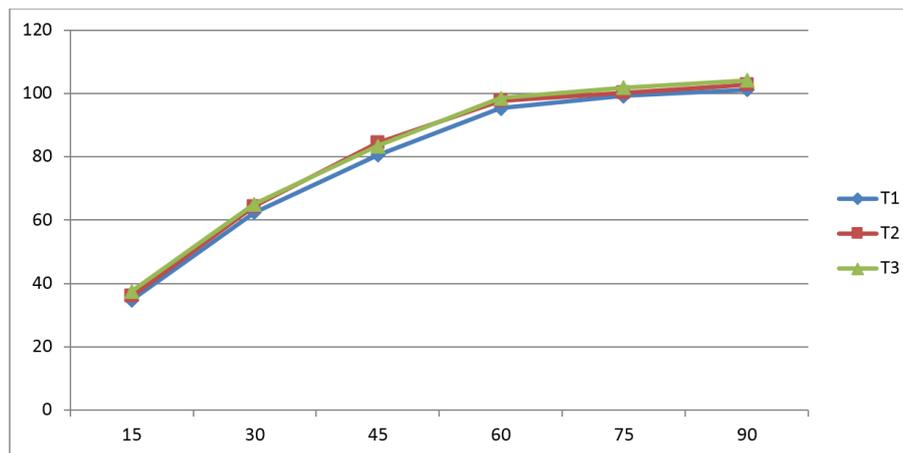


Fig 2: Effect of different fertilizers on plant height of basmati rice 1509.

Number of tillers per hil/plant

Table 2: Periodic number of tillers per plant of basmati rice as affected by different fertilizer and varieties.

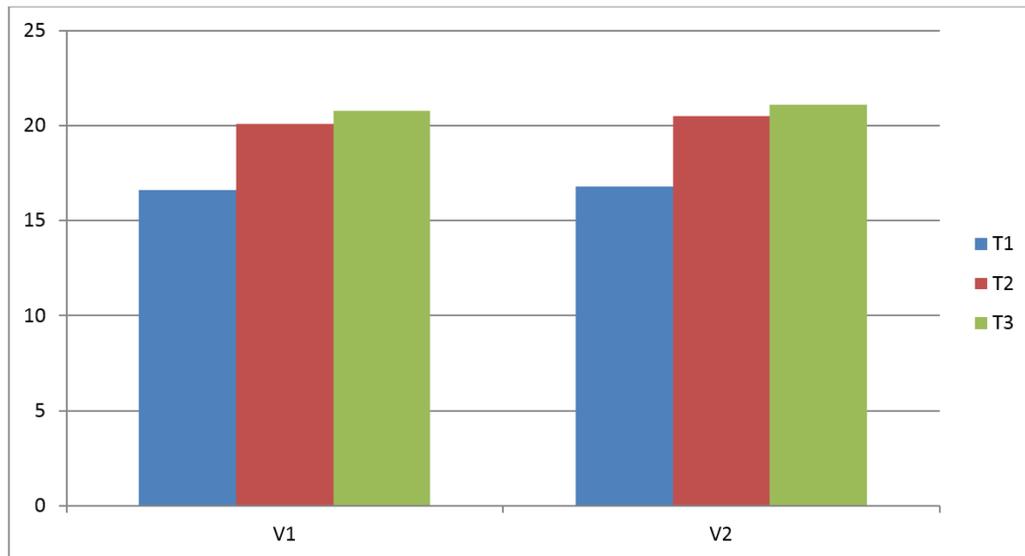
Varieties	V ₁ -1121			V ₂ -1509		
	T ₁	T ₂	T ₃	T ₁	T ₂	T ₃
30 DAT	10	11	12	9	10	11
60 DAT	17	18	19	17	20	20
90 DAT	19	20	22	18	20	21
At harvest	20	21	23	18	20	21
Average	21.3			19.6		

1000 grain weight (gm)**Table 3:** Average 1000-grains weight of basmati rice as affected by different fertilizer and varieties

Variety	V ₁	V ₂	Average
T ₁	28.8	30.6	29.7
T ₂	32.7	32.4	32.6
T ₃	34.7	35.9	35.3
Average	31.7	33.0	32.4

Yield per acre**Table 4:** Yield per acre of basmati rice as affected by different fertilizer and varieties.

Variety	V ₁	V ₂	Average
T ₁	16.6	16.8	16.7
T ₂	20.1	20.5	20.3
T ₃	20.8	21.3	21.6
Average	19.2	19.5	19.6

**Fig 3:** Effect of different fertilizers on yield of V₁ and V₂**Conclusion**

The present study was carried out to study the effect of different fertilizers (Organic and Inorganic) on Basmati Rice. The experiment concluded that among the varieties V₁ (Basmati 1121) had more plant height, dry matter, number of tillers and length of panicle than V₂ in the combined use of FYM + Urea + SSP and V₂ (Basmati 1509) had more grains per panicle, weight of panicle, test weight and yield than V₁ in the same use of fertilizers (FYM + Urea + SSP). So it can be concluded that combined application of fertilizers (FYM + Urea + SSP) gives more yield in V₂ (Basmati 1509) as compared to other treatments.

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