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Response of organic and inorganic fertilizer levels on growth and yield of quinoa (*Chenopodium quinoa* wild.)

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Abstract
A field experiment was conducted during *Rabi* 2024-25 at Crop Research Farm, Department of Agronomy, PRSU, Prayagraj (U.P). The experiment laid out in a Randomized block Design (RBD) along with two factor organic and inorganic fertilizer. The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.4), low in organic carbon (0.30%), available N (65.5 kg/ha), Three organic *viz.*, FYM 10 t ha^{-1}, Vermicompost 3 t ha^{-1}, Poultry manure 2 t ha^{-1} Three inorganic fertilizer *viz.*, 60:30:20 @ NPK kg ha^{-1}, 80:40:30 @ NPK kg ha^{-1},100:50:40 @ NPK kg ha^{-1} as sub-plot factor their combination of Ten treatments which are replicated thrice. The results of experiment based on the analysis were recorded in treatment combinations FYM 10 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}; FYM 10 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}; FYM 10 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}; Vermicompost 3t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}; Vermicompost 3t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}; Vermicompost 3 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}; Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}; Poultry manure 2t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}; Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1};T_{10} - Control. The highest growth attribute parameters; Plant height per plant (120.76 cm), plant dry weight (45.91g), Crop growth rate (7.211g/m^2/day), Crop growth rate (0.007g/g/day), leaf area index (3.71), Number of branches per plant (24.48), Root length (11.97cm), yield components of quinoa by application of T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} was recorded significantly higher *viz.*, number of panicle/plant (19.58), length of panicle (23.68 cm), test weight (2.94 g), seed yield (2.91 t/ha), straw yield (9.92 t/ha), biological yield (12.83 t/ha) and harvest index (22.68%), Economics calculation was recorded highest cost of cultivation (62063.23 Rs), gross return (288369.13 Rs), net return (226305.90 Rs) and benefit cost ratio (3.65) as compared to other treatments. Since, the finding based on the research done in one season.

Keywords: Quinoa**,** organic, inorganic, growth, yield, vermicompost, poultry manure and FYM

Introduction
Quinoa (*Chenopodium quinoa* Wild.) is a nutrient-rich, small-seeded crop originating from the Andean region of South America, where it has been cultivated for over 5,000 years (Vega-Gálvez *et al.*, 2010) [16]. Traditionally grown in countries such as Peru, Bolivia, and Ecuador, quinoa has played a central role in the diets of indigenous populations and holds deep cultural significance (Bhargava *et al.*, 2006) [4]. In recent decades, it has gained global attention as a functional food due to its exceptional nutritional value, versatility, and adaptability to diverse growing environments (Bazile *et al.*, 2016) [3]. Unlike true cereals such as wheat (*Triticum aestivum*) or rice (*Oryza sativa*), quinoa is classified as a pseudo-cereal because it belongs to the family Amaranthaceae, which also includes spinach and amaranth (Repo-Carrasco *et al.*, 2003) [15]. The seeds, available in various colors such as white, red, and black, are naturally gluten-free and rich in high-quality proteins, essential amino acids (particularly lysine), dietary fiber, vitamins, and minerals (Vega-Gálvez *et al.*, 2010) [16]. This unique composition makes quinoa particularly valuable for individuals with gluten intolerance or celiac disease (FAO, 2011) [19]. One of quinoa's most remarkable attributes is its resilience to harsh environmental conditions. It can grow in nutrient-poor soils, tolerate salinity, and withstand both frost and drought, making it an ideal candidate for cultivation in marginal lands (Jacobsen *et al.*, 2003) [11].

The application of fertilizers both organic and inorganic plays a pivotal role in enhancing soil fertility and crop yield. Inorganic fertilizers supply readily available nutrients to plants and promote rapid growth and higher yields. However, continuous and excessive use can degrade soil structure, reduce microbial activity, and contribute to environmental pollution (Chen *et al.*, 2006) [6]. On the other hand, organic fertilizers such as farmyard manure, compost, and vermicompost improve soil physical properties, enhance microbial activity, and ensure a slow and sustained release of nutrients, ultimately contributing to long-term soil health (Edmeades *et al.*, 2003) [7]. Balancing organic and inorganic fertilizers has become a key strategy for sustainable agriculture. Integrating organic and inorganic nutrient sources can optimize nutrient availability, enhance soil fertility, and improve crop productivity while minimizing negative environmental impacts (Chand *et al.*, 2006) [5]. Studies have shown that combined application of organic and inorganic fertilizers leads to better crop performance compared to the sole application of either source (Reddy *et al.*, 2011) [14]. Despite quinoa's adaptability, limited research has focused on its response to varying levels of organic and inorganic fertilizers under different agro-ecological conditions. Understanding these effects is crucial for developing site-specific nutrient management practices to improve quinoa yield and quality sustainably. This study, therefore, aims to evaluate the impact of different levels of organic and inorganic fertilizers on the growth and yield of quinoa, with the goal of identifying an optimal nutrient management strategy for its cultivation.

Material and Methods

The experiment was conducted to know Effect of Organic and Inorganic Fertilizer Levels on Growth and yield of Quinoa (*Chenopodium quinoa* wild.*)* during *Rabi* 2024-25 at Crop Research Farm, Department of Agronomy, PRSU, Prayagraj (U.P). The experiment laid out in a Randomized block Design (RBD) along with two factor organic and inorganic fertilizer. consisting of Ten treatments including Control with 3 replications, with the treatment combinations FYM 10 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}; FYM 10 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}; FYM 10 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}; Vermicompost 3 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}; Vermicompost 3 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}; Vermicompost 3 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}; Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}; Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}; Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1};T_{10} - Control. The experiment was laid out in Randomized Block Design, with ten treatments replicated thrice. The observations were recorded for plant height (cm), plant dry weight (g/plant), Crop growth rate(g/m^2/day), Relative growth rate (g/g/day), Number of branch/plant, Root length(cm) and yield parameters *viz*., number of panicle/plant, length of panicle, test weight, seed yield, straw yield, biological yield and harvest index,. The collected data was subjected to statistical analysis by analysis of varience method (Gomez and Gomez, 1976) [18].

Results and Discussion

Pre-harvest Parameters

Significantly highest plant height (120.76 cm) at harvest, was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (117.77 cm), T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (115.00 cm) significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest value was recorded T_{10} Control. In contrast, inorganic fertilizers like ammonium nitrate have been shown to yield higher seed yields but at the cost of nitrogen efficiency. The study found that quinoa plants under organic fertilizer were more nitrogen efficient, with higher economic nitrogen use efficiency and biological nitrogen use efficiency. These findings underscore the importance of considering both organic and inorganic fertilizers in quinoa cultivation, with organic fertilizers offering a sustainable and beneficial approach to enhancing crop yield and quality (Jimmy *et al.*, 2025) [13]**.**

At Harvest, significantly highest dry weight (45.91 g) was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (39.92 g), T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (39.42 g), significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest value was recorded T_{10} Control (26.56 g). Plant dry weight is a critical indicator of crop growth and biomass accumulation, reflecting the efficiency of nutrient utilization. In quinoa (*Chenopodium quinoa* Wild.), both organic and inorganic fertilizers have been reported to significantly influence dry matter production, although the mechanisms differ. Organic fertilizers, such as farmyard manure, compost, or green manures, improve soil structure, water-holding capacity, and microbial activity. This enhances nutrient availability in a slow-release manner, which supports sustained growth and gradual biomass accumulation. Studies suggest that organic nutrient sources increase root biomass, which in turn facilitates better nutrient uptake, ultimately contributing to higher dry weight in quinoa crops (Hirich *et al.*, 2014) [10]. Inorganic fertilizers, on the other hand, supply readily available nutrients, particularly nitrogen (N), phosphorus (P), and potassium (K), which stimulate rapid vegetative growth. Application of inorganic fertilizers often results in higher shoot dry weight at early growth stages compared to organic sources due to the immediate availability of nutrients. However, over-reliance on chemical fertilizers may lead to nutrient leaching, soil degradation, and reduced efficiency in long-term biomass production (Jacobsen *et al.*, 2012) [12].

At Harvest, significantly highest leaf area index (3.71 m^2) was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (3.48 m^2), T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (3.38 m^2), significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest value was recorded T_{10} Control (2.45 m^2). Leaf area index (LAI) is a measure of the photosynthetically active surface area, directly influencing crop productivity. Organic fertilizers improve soil physical and biological properties, enhancing gradual nutrient release and water retention. This leads to a steady increase in LAI as leaves expand over time (Hirich *et al.*, 2014) [10]. In contrast, inorganic fertilizers, particularly nitrogen-based, stimulate rapid vegetative growth and higher LAI in early stages due to the immediate availability of nutrients (Jacobsen *et al.*, 2012) [12].

Significantly highest Number of branches per plant (24.48) At Harvest, was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (22.33), T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (23.62) significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest Number of branches per plant (m^2) was recorded T_{10} Control (16.67). Branching in quinoa is influenced by nutrient supply, especially nitrogen and phosphorus. Organic amendments enhance soil fertility gradually and support balanced hormonal regulation, leading to moderate but healthy branching patterns. Inorganic fertilizers typically increase the number of branches more rapidly due to higher nitrogen uptake, which promotes vegetative development. However, excessive nitrogen may lead to excessive branching at the cost of reproductive development. An integrated nutrient strategy provides a balanced number of branches, ensuring vigorous vegetative growth without compromising yield potential (Hernandez-Linares & Vadell, 2016) [9].

At Harvest, significantly highest Root length (11.97 cm) was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (11.80 cm), T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (10.92 cm), significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest value was recorded T_{10} Control (7.52). Root development in quinoa is strongly associated with soil conditions and nutrient availability. Organic fertilizers improve soil structure, porosity, and microbial activity, which encourage deeper and more extensive root growth (Fuentes *et al.*, 2012) [8]. A combination of organic and inorganic fertilizers has been shown to maximize root length, as the organic inputs improve soil health while inorganic inputs ensure readily available nutrients **(**Adams *et al.*, 2020) [1].

Post-harvest observation

Number of panicles per plant

Data pertaining to Number of panicles per plant was recorded after harvest and tabulated in table 2.

From the data that among different treatment combinations, treatment At Harvest, significantly highest Number of panicles per plant (19.58) was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (18.33), T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (18.25), significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest value was recorded T_{10} Control (11.33).

Length of Panicle (cm)

Significantly highest Length of Panicle (23.68 cm) At Harevst, was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (22.16 cm), T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (23.27 cm) significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest Length of Panicle (16.33 cm) was recorded T_{10} Control. The combined use of chicken manure and PSB significantly enhanced panicle length by improving phosphorus and nitrogen availability, boosting plant metabolism and reproductive growth. Organic manure improves soil health and nutrient uptake (Verma *et al.*, 2019) [17], while PSB enhances phosphorus acquisition, leading to better yields (Ali *et al.*, 2021) [2].

Test weight (g)

At after threshing and winnowing, significantly highest Test weight (2.94 g) was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (2.86 g), T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (2.88 g) significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest value was recorded T_{10} Control (2.57 g). The increase in test weight is due to improved nutrient availability and seed filling from the combined use of organic, as noted by Yadav *et al.*, (2018) [20].

Seed yield (t/ha)

From the data that among different treatment combinations, treatment At Harvest, significantly highest Seed yield (2.91 t/ha) was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (2.74 t/ha), T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (2.58 t/ha), significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest value was recorded T_{10} Control (1.43 t/ha). Seed yield in quinoa depends on nutrient availability, photosynthetic efficiency, and assimilate partitioning. Organic fertilizers such as compost, farmyard manure, or vermicompost release nutrients slowly, improving soil microbial activity and organic matter content. This enhances nutrient-use efficiency and results in steady improvement in seed yield over time (Hirich *et al.*, 2014) [10]. However, yields obtained from solely organic sources may be lower than inorganic fertilization in the short term due to slower nutrient release. Inorganic fertilizers, particularly nitrogen (N), phosphorus (P), and potassium (K), provide immediate nutrient availability, which accelerates flowering and grain filling. This often results in higher seed yields under optimal conditions (Bhargava *et al.*, 2006) [4]; (Adams *et al.*, 2020) [1].

Significantly highest Straw yield (9.92nt/ha) at harvest, was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (9.58 t/ha), T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (9.81 t/ha) significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest Straw yield (8.58 t/ha) was recorded T_{10} Control. Straw yield is a measure of total vegetative biomass, which is also influenced by fertilizer application. Organic fertilizers improve soil structure and water-holding capacity, encouraging robust vegetative growth and thereby contributing to higher straw yield (Fuentes *et al.*, 2012) [8].

Inorganic fertilizers stimulate rapid shoot development and biomass accumulation, often resulting in higher straw yields in the short term. However, the sustainability of this increase may be limited if soil fertility declines over time due to continuous inorganic input. When both fertilizer types are combined, the positive effects are cumulative (Hernandez-Linares & Vadell, 2016) [9].

Biological yield (t/ha)

At after threshing and winnowing, significantly highest biological yield (12.83 t/ha) was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (12.15 t/ha), T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (12.55 t/ha) significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest value was recorded T_{10} Control (10.01 t/ha).

Harvest index (%)

At after threshing and winnowing, significantly highest harvest index (22.68%) was recorded in treatment nine with the organic and inorganic fertilizer, Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}. However, treatment eight and treatment seven T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1} (21.20%), T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1} (21.85%) significantly at par with T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} and lowest value was recorded T_{10} Control (14.11%).

Table 1: Effect of Organic and Inorganic fertilizer levels on yield and yield attributes in quinoa

Treatments	Number of panicles/Plant	Length of Panicle (cm)	Test weight (g)	Seed yield (t/ha)	Strow yield (t/ha)	Biological yield (t/ha)	Harvest index (%)
T_1- FYM 10 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}	15.00	16.51	2.73	1.69	8.68	10.37	16.21
T_2- FYM 10 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}	15.33	17.00	2.76	1.88	9.38	11.26	16.73
T_3- FYM 10 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}	15.67	17.17	2.81	2.01	9.44	11.45	17.54
T_4- Vermicompost 3 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}	16.00	18.86	2.82	2.22	9.50	11.71	18.94
T_5- Vermicompost 3 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}	16.33	19.73	2.82	2.34	9.56	11.90	19.64
T_6- Vermicompost 3 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}	17.20	21.86	2.82	2.47	9.56	12.04	20.53
T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}	18.25	22.16	2.86	2.58	9.58	12.15	21.20
T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}	18.33	23.27	2.88	2.74	9.81	12.55	21.85
T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}	19.58	23.68	2.94	2.91	9.92	12.83	22.68
T_{10}- Control plot	11.33	16.33	2.57	1.43	8.58	10.01	14.11
F test	S	S	S	S	S	S	S
SEm(±)	1.15	1.84	0.10	0.12	0.21	0.26	1.00
CD (5%)	3.43	5.47	0.32	0.36	0.65	0.80	2.99

Table 2: Effect of Organic and Inorganic fertilizer levels on pre harvest in quinoa

Treatments	Pre-harvest Parameters				
	Plant height (cm)	Plant dry weight (g)	Number of branches per plant	Root length (cm)	Leaf area index (m^2)
T_1- FYM 10 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}	99.19	33.29	18.67	8.81	2.75
T_2- FYM 10 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}	101.06	35.22	18.67	9.58	2.92
T_3- FYM 10 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}	109.95	37.35	19.33	9.67	2.99
T_4- Vermicompost 3 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}	110.46	37.72	19.67	9.83	3.14
T_5- Vermicompost 3 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}	114.79	38.62	20.98	10.23	3.19
T_6- Vermicompost 3 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}	115.01	39.33	21.40	10.47	3.24
T_7- Poultry manure 2 t ha^{-1} + 60:30:20 @ NPK kg ha^{-1}	116.92	39.42	22.33	10.92	3.38
T_8- Poultry manure 2 t ha^{-1} + 80:40:30 @ NPK kg ha^{-1}	118.00	39.92	23.62	11.80	3.48
T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1}	120.76	45.91	24.48	11.97	3.71
T_{10}- 120. Plot	98.68	26.56	16.67	7.52	2.45
F test	S	S	S	S	S
SEm(±)	4.34	2.09	1.48	0.457	0.215
CD (5%)	12.91	6.21	4.41	1.36	0.64

Conclusion

It was concluded that for obtaining higher growth parameters was obtained that plant height (120.76 cm), plant dry weight (45.91 g), number of branch per plant (24.48), root length (11.97 cm) and leaf area index (3.71), yield components of quinoa by application of T_9- Poultry manure 2 t ha^{-1} + 100:50:40 @ NPK kg ha^{-1} was recorded significantly higher *viz.*, number of panicle/plant (19.58), length of panicle (23.68 cm), test weight (2.94 g), seed yield (2.91 t/ha), straw yield (9.92 t/ha), biological yield (12.83 t/ha) and harvest index (22.68%), Economics calculation was recorded highest cost of cultivation (62063.23 Rs), gross return (288369.13 Rs), net return (226305.90 Rs) and benefit cost ratio (3.65) as compared to other treatments. Since, the finding based on the research done in one season.

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