

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 8; August 2026; Page No. 114-116

Received: 11-06-2026
Accepted: 14-07-2026

Indexed Journal
Peer Reviewed Journal

Evaluation of tillage practices, fertility levels and liquid biofertilizer on quality and productivity of wheat (*Triticum aestivum* L.)

¹Shalini Meena, ²RK Meena, ³BS Meena, ⁴MK Sharma, ⁵Yamini Tak and ⁶CK Jadon

¹Ph.D. Research Scholar, College of Agriculture, Ummedganj, Rajasthan, India

^{2, 3, 4, 5, 6}Agriculture Research Station, Kota, Rajasthan, India

DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i8b.3994>

Corresponding Author: Shalini Meena

Abstract

A field experiment was conducted during the *rabi* season to evaluate the effects of tillage practices, fertility levels, and liquid biofertilizers on productivity and quality of wheat (*Triticum aestivum* L.) under the agro-climatic conditions of South-Eastern Rajasthan. The experiment was laid out in a split-split plot design with four replications. The treatments comprised three tillage practices, viz., conventional tillage, minimum tillage, and zero tillage; three fertility levels, viz., 125% RDF, 100% RDF, and 75% RDF; and two liquid biofertilizer treatments, viz., no biofertilizer and NPK liquid biofertilizer. The results revealed that all tillage practices were found non-significant to sugar content in wheat but conventional tillage resulted in highest grain yield, straw yield, biological yield, protein content, protein yield over zero tillage and remained at par with minimum tillage. Among fertility levels, application of 125% RDF recorded the highest values of productivity and quality parameters, followed by 100% RDF, whereas 75% RDF resulted in the lowest performance. The application of NPK liquid biofertilizer significantly improved grain yield, straw yield, biological yield, protein content, protein yield, total sugars, reducing sugars, and non-reducing sugars compared with no biofertilizer.

Keywords: Wheat, tillage practices, fertility levels, liquid biofertilizer, quality, productivity

Introduction

Wheat (*Triticum aestivum* L.) is one of the most important cereal crops in the world and serves as a staple food for nearly 35–40 per cent of the global population. It is known as the king of cereal and distinguished by its nutritional richness. Wheat emerges as a nutritional powerhouse, boasting a composition that includes 8.0–15.0% protein, 60–68% starch, 1.5–2.0% fat, 2.0–2.5% cellulose, and 1.5–2.0% minerals. Its versatility and nutritional value make it a cornerstone of diets worldwide. It is a dietary mainstay for millions of Indians, providing a significant portion of their daily caloric intake (Parewa *et al.* 2019) [6]. Wheat-based products, such as chapati and bread, are dietary staples, making it a crucial source of carbohydrates and nutrition. In India, wheat occupies a pivotal position in the agricultural economy and is the second most important food grain after rice, playing a vital role in ensuring national food security. Achieving higher wheat productivity with superior grain quality has become increasingly challenging due to deteriorating soil health, imbalanced fertiliser use, intensive cultivation practices and declining resource-use efficiency. Among the various agronomic interventions, tillage practices greatly influence soil physical properties, moisture conservation, nutrient availability, root development and microbial activity, thereby affecting crop growth, productivity and grain quality. Conventional tillage generally provides favourable soil conditions for crop establishment, whereas conservation tillage practices are increasingly being promoted for

sustainable crop production and resource conservation. Likewise, balanced fertiliser application is essential for maintaining optimal nutrient availability, enhancing photosynthetic efficiency, improving protein synthesis, and increasing grain yield and quality. Application of appropriate fertility levels not only improves nutrient use efficiency but also sustains soil fertility and crop productivity (Jat *et al.*, 2023) [3]. In recent years, liquid biofertilizers have emerged as eco-friendly and sustainable nutrient management tools because they enhance nutrient solubilization, biological nitrogen fixation, the production of plant growth-promoting substances, and nutrient uptake, ultimately improving crop productivity and grain quality (Terefe *et al.*, 2018) [8], while reducing dependence on chemical fertilisers.

Materials and Methods

A field experiment was conducted during the *rabi* season at the Instructional Farm, College of Agriculture, Ummedganj, Kota, Rajasthan. The experimental field was characterised by clay loam soil. The study was laid out in a split-split plot design with four replications. The treatments comprised three tillage practices, namely conventional tillage, minimum tillage, and zero tillage, assigned to the main plots; three fertility levels, viz., 125%, 100%, and 75% of the recommended dose of fertilizers, allocated to the sub-plots; and two liquid biofertilizer treatments, namely no biofertilizer and NPK liquid biofertilizer, assigned to the sub-sub plots. The wheat variety Raj 4079 was sown at a seed rate

of 100 kg/ha with a row spacing of 22.5 cm. The recommended doses of nitrogen, phosphorus, and potassium were supplied through urea, diammonium phosphate, and muriate of potash, respectively. Fertilizers were applied by the broadcasting method according to the treatment plot. The entire quantity of phosphorus and potassium, along with half of the recommended nitrogen, was applied as a basal dose at the time of sowing, whereas the remaining half of the nitrogen was top-dressed at the first irrigation to ensure a continuous supply of nutrients during the critical stages of crop growth. The NPK liquid biofertilizer was applied as a seed treatment before sowing following the recommended protocol. All other recommended agronomic and plant protection practices were adopted uniformly across the experimental plots throughout the cropping season to ensure healthy crop growth and eliminate any confounding effects of crop management.

Results and Discussion

The quality parameters of wheat, viz., protein content, protein yield, starch content, total sugars, reducing sugars and non-reducing sugars, were influenced by tillage practices, fertility levels and liquid biofertilizer (Table 1). Among the tillage practices, conventional tillage recorded significantly higher protein content and protein yield over zero tillage and remained statistically at par with minimum tillage. However, the effect of tillage practices on total sugars, reducing sugars and non-reducing sugars was found to be non-significant. Among the fertility levels, application of 125% RDF recorded significantly higher protein content, protein yield, total sugars, reducing sugars and non-reducing sugars, which remained statistically at par with 100% RDF and superior to 75% RDF. Application of NPK liquid biofertilizer

significantly improved all quality parameters compared with no biofertilizer.

The productivity of wheat, as measured by grain yield and straw yield, was significantly influenced by tillage practices, fertility levels and liquid biofertilizer (Table 2). Conventional tillage recorded significantly higher grain yield (55.20 q/ha), straw yield (70.92 q/ha) and biological yield over zero tillage and remained statistically at par with minimum tillage. The superior productivity under conventional tillage may be attributed to better seedbed preparation, improved soil aeration, greater moisture conservation, enhanced root proliferation and efficient absorption of nutrients, which collectively promoted higher dry matter production and yield (Sumitra *et al.* 2024, and Para *et al.* 2025) [7, 5]. Among the fertility levels, application of 125% RDF produced significantly higher grain yield (55.42 q/ha) and straw yield (71.64 q/ha), remaining statistically at par with 100% RDF and significantly superior to 75% RDF. The increased productivity under higher fertility levels was mainly due to the adequate availability of essential nutrients throughout the crop growth period, leading to enhanced vegetative growth, increased photosynthetic efficiency, greater dry matter accumulation and efficient partitioning of assimilates towards grain formation (Meena *et al.* 2023, Athnere *et al.* 2024) [4, 1]. Similarly, application of NPK liquid biofertilizer significantly increased grain yield (49.91 q/ha) and straw yield over no biofertilizer. The beneficial effect of NPK liquid biofertilizer may be attributed to improved nutrient solubilization and uptake, enhanced microbial activity in the rhizosphere and increased nutrient use efficiency, resulting in higher biomass production and grain yield. (Chauhan 2014, Trivedi *et al.* 2020) [2, 9].

Table 1: Influence of Tillage Practices, Fertility Levels and Liquid Biofertilizer on the Quality Parameter of wheat

Treatments	Crude protein content (%)	Protein yield (kg/ha)	Starch content	Total sugar	Reducing sugar	Non-reducing sugar
Tillage practices						
Zero tillage	10.94	473.52	68.90	38.06	8.78	27.78
Minimum tillage	11.66	621.20	69.61	38.14	9.93	28.20
Conventional tillage	11.72	646.85	70.16	39.10	10.56	28.54
SEm+	0.12	11.14	0.31	0.21	0.10	0.15
CD (P=0.05)	0.35	34.33	NS	NS	NS	NS
Fertility levels						
75% RDF	10.84	512.49	67.59	37.07	9.19	26.78
100% RDF	11.53	617.71	70.13	38.79	10.12	28.67
125% RDF	11.72	649.44	70.94	39.44	10.36	29.08
SEm+	0.12	10.74	0.32	0.23	0.11	0.15
CD (P=0.05)	0.36	33.14	0.91	0.66	0.30	0.44
Liquid biofertilizers						
No biofertilizer	10.97	469.42	68.34	37.47	9.72	27.75
NPK liquid biofertilizer	11.69	577.43	70.77	39.40	10.80	28.60
SEm+	0.05	5.37	0.25	0.17	0.08	0.12
CD (P=0.05)	0.16	15.22	0.72	0.48	0.22	0.35

Table 2: Influence of Tillage Practices, Fertility Levels and Liquid Biofertilizer on the yield of wheat

Treatments	Grain yield (q/ha)	Straw yield (q/ha)	HI (%)
Tillage practices			
Zero tillage	43.29	58.86	42.38
Minimum tillage	53.29	69.06	43.55
Conventional tillage	55.20	70.92	43.76
SEm+	0.62	1.57	0.71
CD (P=0.05)	1.91	4.71	NS

Fertility levels			
75% RDF	47.26	63.79	42.56
100% RDF	53.57	69.68	43.46
125% RDF	55.42	71.64	43.61
SEm±	0.63	1.59	0.64
CD (P=0.05)	1.90	4.80	NS
Liquid biofertilizers			
No biofertilizer	42.80	58.44	42.27
NPK liquid biofertilizer	49.91	63.85	43.62
SEm±	0.65	1.04	0.51
CD (P=0.05)	1.94	3.15	NS

Conclusion

Among the tillage practices, conventional tillage recorded the highest productivity (55.20 & 70.92 q/ha, grain & straw yield, respectively), protein content (11.72%) and protein yield (646.85 kg/ha), followed by minimum tillage, whereas zero tillage resulted in significantly lower performance. However, the effect of tillage practices on total sugars, reducing sugars and non-reducing sugars was found to be non-significant. Among the fertility levels, application of 125% RDF produced the highest quality parameters, grain yield (55.42 q/ha) and straw yield, which remained statistically at par with 100% RDF, while 75% RDF recorded the lowest values. Similarly, application of NPK liquid biofertilizer significantly improved grain yield (49.91 q/ha), straw yield, protein content (11.69%), protein yield, total sugars, reducing sugars and non-reducing sugars over control (no biofertilizers).

References

- Athnere S, Chaplot PC, Yadav P, Garg K. Effect of fertility levels and liquid biofertilizers on quality parameters of malt barley (*Hordeum vulgare*). Indian Journal of Agronomy. 2024;69(4):460-465.
- Chauhan RS. Effect of fertility and weed management on yield, nutrient uptake and economics of wheat. Annals of Plant and Soil Research. 2014;16(4):304-307.
- Jat ML, Chaplot PC, Dhayal BC, Meena R, Meena SN. Integrated nutrient management in barley (*Hordeum vulgare* L.) under the central plateau and hills agroecological region. Indian Journal of Agronomy. 2023;68(1):20-25.
- Meena RK, Meena NL, Yadav BD. Effect of liquid biofertilizer consortia on growth, yield and soil fertility status in wheat (*Triticum aestivum* L.) under South-Eastern Rajasthan. Journal of Plant Nutrition. 2023;46(1):55-65.
- Para PK, Kushwah SS, Tiwari RK, Sharma K, Sharma BK. Role of herbicides and tillage on weeds and wheat (*Triticum aestivum* L.) yield in northern region of Madhya Pradesh. The Indian Journal of Agricultural Sciences. 2025;95(4):383-388.
- Parewa HP, Ram M, Jain LK, Choudhary A, Ratnoo SD. Impact of organic nutrient management practices on yield attributes, yield and economics of wheat (*Triticum aestivum* L.). International Journal of Bio-resource and Stress Management. 2019;10(3):257-260.
- Sumitra G, Rajkumara S, Kumar DL. Response of tillage method and residue management on productivity and soil biological properties of wheat. Indian Journal of Agronomy. 2024;69(4):369-377.
- Terefe D, Desalegn T, Ashagre H. Effects of nitrogen fertiliser levels on grain yield and quality of malt barley varieties of Wolmera district, Central Highland of Ethiopia. International Journal of Research in Agricultural Sciences. 2018;4(4):29-43.
- Trivedi VK, Raza BMD, Dimree S, Verma AK, Pawar BA, Upadhyay DP. Effect of balanced use of nutrients on yield attributes, yield and protein content of wheat (*Triticum aestivum* L.). Indian Journal of Agricultural Sciences. 2020;90(12):2369-2372.