E-ISSN: 2618-0618
P-ISSN: 2618-060X

NAAS Rating: 5.20
www.agronomyjournals.com
2025; 8(6): 705-707
Received: 09-03-2025
Accepted: 11-04-2025

Tana Yamin
Department of Agriculture, Himalayan University, Jullang, Itanagar, Arunachal Pradesh, India

Lipi Rina
Department of Agriculture, Himalayan University, Jullang, Itanagar, Arunachal Pradesh, India

Kasinam Doruk
Department of Agriculture, Himalayan University, Jullang, Itanagar, Arunachal Pradesh, India

Chukhu Mercy
Department of Agriculture, Himalayan University, Jullang, Itanagar, Arunachal Pradesh, India

Tadar Rija
Department of Agriculture, Himalayan University, Jullang, Itanagar, Arunachal Pradesh, India

Corresponding Author:
Tana Yamin
Department of Agriculture, Himalayan University, Jullang, Itanagar, Arunachal Pradesh, India

Study of organic manures and bio-fertilizers on the nutritional value of barley (*Hordeum vulgare* L.)

Tana Yamin, Lipi Rina, Kasinam Doruk, Chukhu Mercy and Tadar Rija

DOI: https://www.doi.org/10.33545/2618060X.2025.v8.i6i.3091

Abstract
A field trial (*Rabi* 2024-2025) evaluated how three organic manures-poultry, goat and vermi- compost and two bio-fertilizers (*Azotobacter* and *Phosphate solubilising bacteria*) influence grain carbohydrate and protein concentrations in barley grown on an acid sandy-loam soil of Arunachal Pradesh. Seven treatment combinations were tested in a randomized block design with three replications. Grain carbohydrate and protein were quantified by the Anthrone and Kjedahl methods respectively. Poultry manure + PSB (T2) produced the greatest improvements, raising carbohydrate and protein contents significantly over the uninoculated control. Result demonstrate that integrating nutrient- rich organic manure with targeted microbial inoculants can enrich barley grain nutritionally while reducing dependence on synthetic fertilizers.

Keywords: *Azotobacter*, *Phosphate solubilising bacteria* (PSB), vermi-compost, poultry manure, goat manure, carbohydrate content, protein content

1. Introduction
Barley (*Hordeum vulgare* L.) is an annual cereal grain crop belonging to the family poaceae. It is basically grass crop and considered to be the fourth most important crop in the world after wheat, maize and rice in acreage and production (FAO, 2017) [4]. Barley is a resilient cereal grain widely grown across the globe, particularly valued for its ability to thrive under stress conditions such as drought and salinity. Apart from its agronomic resilience, barley possesses notable nutritional benefits including high dietary fiber, beta-glucans, and a balanced profile of carbohydrates and proteins (Zeng *et al*., 2020) [10]. In India, barley grain typically contains 74-76% carbohydrates and 8-10% protein, but both fractions vary markedly with nutrition management (Kumar *et al*., 2018) [6].
Integrated use of organic manures and bio-fertilizers has gained attention due to their positive effects on crop yield and nutritional quality. Bio-fertilizers like *Azotobacter* and PSB improve nutrient availability and plant uptake through biological nitrogen fixation and solubilisation of bound phosphates, respectively (Chen *et al*., 2006 and Ram *et al*., 2014) [3, 8]. This study explores how combinations of such organic inputs influence the nutritional quality specifically the carbohydrate and protein content of barley.

2. Materials and Methods
2.1 Location and Experimental Design
The field experiment was conducted during the *Rabi* season of 2024 at the research farm of Himalayan University, Jullang, Itanagar, Arunachal Pradesh. RD2503 variety of barley was used in the experimentation. The experiment was laid out in a Randomized Block Design (RBD) with seven treatment and three replications. The plot size was 3mX3m with spacing of 25cm X 25cm. The treatments were as follows:
T0- Control
T1- Poultry manure + *Azotobacter*
T2- Poultry manure + *Phosphate solubilising Bacteria*

T3- Green manure + *Azotobacter*
T4- Green manure + *Phosphate solubilising Bacteria*
T5- Vermicompost + *Azotobacter*
T6- Vermicompost + *Phosphate solubilising Bacteria*

2.2 Soil and Climatic Conditions: Soil type: Sandy loam with pH 4.17
Climatic conditions were typical of humid-subtropical *Rabi* season.

2.3 Nutritional Analysis
Carbohydrate content was determined using Anthrone method (Sadasivam & Manickam, 1996) [9] and protein content was calculated using the Kjedahl method (AOAC, 2010) [1] with a conversion factor of 6.25 for nitrogen to protein.

3. Results and Discussion
3.1 Carbohydrate content
The treatment T2 (Poultry manure + PSB) recorded the highest carbohydrate content, significantly superior to all other treatments including the control (T0). The enhanced carbohydrate accumulation may be attributed to improved phosphorus availability and microbial activity promoted by PSB (Baas *et al*., 2016 and Ram *et al*., 2014) [2, 8].

Protein content
Protein content was also significantly increased under treatment T2. This synergistic effect likely stems from poultry manure's rich organic matter content coupled with PSB's ability to make phosphorus more available for protein synthesis (Chen *et al*., 2006 and Gull *et al*., 2004) [3, 5].

Table 1: Effect of organic manure and bio-fertilizers on the nutritional value of Barley.

Treatment		Carbohydrate content (%)	Protein content (%)
T0	Control	54.3	7.3
T1	Poultry manure + *Azotobacter*	58.1	9
T2	Poultry manure + *Phosphate solubilising Bacteria*	59.1	9.1
T3	Goat manure + *Azotobacter*	56	8.4
T4	Goat manure + *Phosphate solubilising Bacteria*	58.1	8.2
T5	Vermicompost + *Azotobacter*	56.1	8.7
T6	Vermicompost + *Phosphate solubilising Bacteria*	58	8.6
	F test	S	S
	S.Ed (±)	0.4	0.08
	CD	0.9	0.17
	(P = 0.05)		

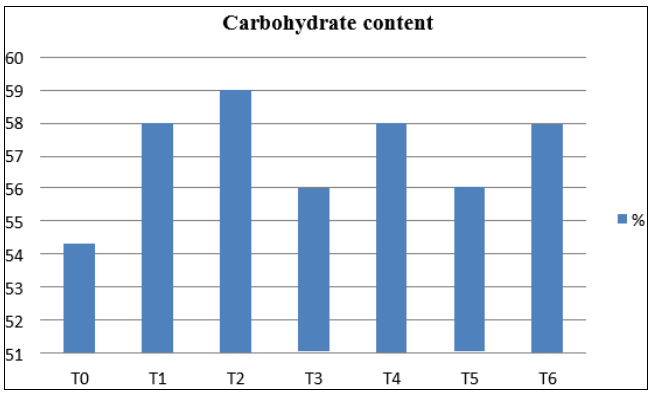

Fig 1: Graph of Carbohydrate content

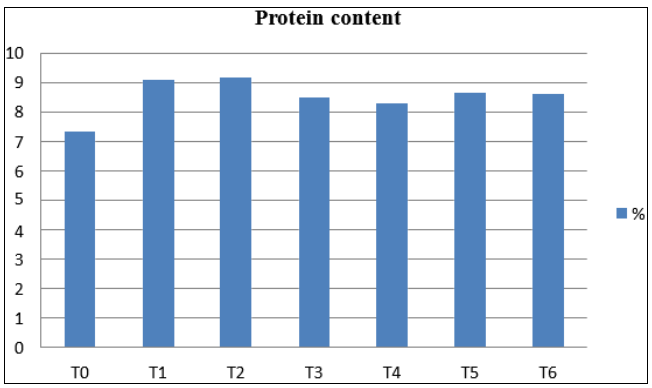

Fig 2: Graph of protein content

The results are consistent with findings by Mutlu *et al*. (2020) [7], who observed that microbial fertilizers improve nutrient availability and grain composition.

4. Conclusion
The combination of poultry manure and *Phosphate solubilising bacteria* in treatment (T2) was found to significantly improve the nutritional quality of barley in terms of carbohydrate and protein content. This indicates the potential of integrated nutrient management strategies using organic and microbial inputs in enhancing both productivity and nutritional value of cereal crops like barley.

5. References
1. AOAC. Official methods of analysis. 18th ed. Washington (DC): Association of Official Analytical Chemists; 2010. Method 14.068, p. 2057.
2. Baas P, Bell C, Mancini LM, Lee M, Contant N, Wallenstein RT, *et al*. Phosphorus mobilizing consortium Mammoth PTM enhances plant growth. Peer J. 2016;4:e2121.
3. Chen YP, Rekha PD, Arun AB, Shen FT, Lai WA, Young CC. Phosphate solubilising bacteria from subtropical soil and their tricalcium phosphate solubilising abilities. Appl Soil Ecol. 2006;34(1):33-41.
4. Food and Agriculture Organization (FAO). FAOSTAT. 2017. http://www.fao.org/faostat/en#data/QC
5. Gull M, Hafeez FY, Saleem M, Malik KA. Phosphorus uptake and growth promotion of chickpea by co-inoculation of mineral phosphate solubilising bacteria and a mixed rhizobial culture. Aust J Exp Agric. 2004;44(6):623-8.
6. Kumar D, Narwal S, Kharub AS, Singh GP. Scope of food barley research and development in India. Soc Adv Wheat Barley Res. 2018;10(3):166-72.
7. Mutlu A. Combined use of organic and microbial fertilizers improves barley (*Hordeum vulgare* L.) yield. Turk J Agric For. 2020;44(2):111-8.

8. Ram M, Davari MR, Sharma SN. Direct, residual and cumulative effects of organic manures and biofertilizers on yields, uptake, grain quality and economics of wheat (*Triticum aestivum*) under organic farming of rice-wheat cropping system. J Org Syst. 2014;9(1):16-30.
9. Sadasivam S, Manickam A. Biochemical methods. 2nd ed. New Delhi: New Age International; 1996.
10. Zeng Y, Pu X, Du J, Yang X, Li X, Mandal MSN, *et al*. Molecular mechanism of functional ingredients in barley to combat human chronic disease. Oxid Med Cell Longev. 2020;2020:Article ID 5130296.