

IMPROVEMENT IN PRODUCTION AND QUALITY OF WHEAT UNDER ORGANIC NUTRIENT MANAGEMENT

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ABSTRACT

An experiment was conducted with twelve treatment combinations of organic N levels and organic liquid formulations along with one outside chemical control to find the effect of organics on yield and quality of wheat at Certified Organic Farm, ACHF, Navsari Agricultural University, Navsari during 2011-12 and 2012-13. These treatments were replicated thrice in factorial randomized block design. It was found that all the yield and quality parameters were increase with increase in recommended dose of N through BC:VC:CC. The treatments receiving application of 100% BC:VC:CC (O₃) and spraying of 1% enriched banana pseudostem sap (S₁) significantly increased the grain and straw yield of wheat as well as protein and dry gluten content as compared to rest of the treatments containing organics N levels and different organic liquid formulations, respectively. While, organics treatment found beneficial in producing higher yield and better quality of wheat.

INTRODUCTION

Wheat (*Triticum aestivum*) is the most important extensively grown food crop in the world. It is the second important staple food crop in India next to the China, rice being the first. India is the 3rd largest producer of wheat all over the world. Organic manures were traditionally and preferentially used in developing countries until 1960's before the inorganic chemical fertilizers began to gain popularity. Chemical fertilizers virtually replaced sources of crop nutrients in some developing countries during early 1970's (FAO, 1985) as these became easily available and unlike organic manures, they were less bulky and thus, easier to transport, handle and store. They produced greater crop response than many organic types of manure.

High-analysis chemical fertilizers have a short-term effect on productivity but a longer-term negative effect on the environment as its imbalanced and indiscriminate use has developed many problems like sodicity, deterioration in the quality of crop produce, increase in hazardous pests and diseases and increase in soil pollutants (Chakraborti and Singh, 2004). The prolonged and over-use of chemicals than crop requirement resulted in human health hazards and imbalance in natural resources. But nitrogen rate, type of nitrogen and time of application are important factors to increase wheat yield (Garrido-Lestache *et al.*, 2005; Grant *et al.*, 2001). Furthermore, nitrogen fertilization is useful to enhance the baking quality parameters such as protein content and protein quality (Grant *et al.*, 2001). Patil and Bhilare (2000), Randhe *et al.* (2009) and Shah *et al.* (2013) in wheat and Kulkarni

(2012) in rice crop also found the beneficial results of N fertilization of wheat quality parameters. Hence now days, organic fertilizers are necessary as a remedy to maneuver the ill-effects from chemical farming, to provide the crop nutritional demand to produce higher yield as well as to improve quality of produce by supplying various organic manures in balanced proportion. The present investigation was carried out to find out the cheaper source of organics to enhance the yield and improve the quality of wheat.

MATERIALS AND METHODS

An experiment was conducted at Certified Organic Farm of ACHF, Navsari Agricultural University, Navsari (Gujarat) by using Wheat variety 'GW-496' during 2011-12 and 2012-13. The soil of the present study was low in available N (238 kg ha⁻¹), medium in available P₂O₅ (48 kg ha⁻¹), high in K₂O (380 kg ha⁻¹) and clay in texture. This experiment was containing thirteen treatments of different organic nutrient sources. These treatments includes twelve combinations of three N levels applied through BC:VC:CC based on RDN (O₁: 50% N, O₂: 75% N and O₃: 100% N) and four sprays of organic liquid formulations (S₁: 1% enriched banana pseudostem sap, S₂: 1% vermiwash, S₃: 1% panchgavya and S₄: 1% cow urine) along with one chemical control (100% RDF). The treatments were replicated three times under factorial randomized block design (FRBD). Organic manures on the basis of RDF were applied in two splits, half as a basal dose and half at 30 DAS whereas organic liquid formulations were sprayed at 15, 30 and 45 DAS. The observations were recorded on grain yield, straw yield of wheat as well as protein (firstly total N was

Table 1: Effect of organics N levels and organic liquid formulations on yield and quality of wheat (pooled data of 2011-12 and 2012-13)

Treatments	Grain yield(q ha ⁻¹)	Straw yield(q ha ⁻¹)	Protein content (%)	Dry gluten content (%)
Organics N levels (%)				
O ₁	19.27	30.26	11.44	8.38
O ₂	21.52	33.37	12.01	8.75
O ₃	24.00	37.20	12.43	8.96
SEm+	0.50	0.55	0.15	0.10
C.D.@5%	1.43	1.55	0.43	0.28
Organic liquid formulations (foliar application)				
S ₁	23.37	35.67	12.52	8.97
S ₂	20.62	32.59	11.81	8.64
S ₃	20.10	31.99	11.40	8.33
S ₄	22.29	34.19	12.12	8.85
SEm+	0.58	0.63	0.18	0.11
C.D.@5%	1.65	1.79	0.50	0.32
Interaction	NS	NS	NS	NS
Control vs Rest				
Organics (mean)	21.60	33.61	11.96	8.69
Control	19.78	31.96	11.13	8.27
SEm+	0.75	0.80	0.23	0.14
C.D.@5%	NS	NS	0.66	0.40

determined by Kjeldahl method and its result multiplied by factor 6.25) and dry gluten content (dough-ball method) in wheat grains and data was analyzed as per statistical methods given by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Wheat yield

The pooled data presented in Table 1 indicated that the different organic N levels and organic liquid formulations sprays showed significant difference on grain and straw yield of wheat crop. Significantly highest grain and straw yield were obtained with the treatment receiving application of 100% N through BC:VC:CC (O₃) over treatments O₂ and O₁. Increase in grain yield might be due better utilization of nutrients, improvement in physical and chemical properties of soil as well as increase in microbial activity in soil while, increase in straw yield might be due to availability of large quantity of nutrients through combined application of bulky and concentrated organic manures *viz.*, bio-compost, vermicompost and castor cake. These results were also found by Patil and Bhilare (2000); Tripathi *et al.* (2007); Randhe *et al.* (2009), Patil (2013) and Naik *et al.* (2014).

Among treatments receiving different organic liquid formulations, the treatment containing spraying of 1% enriched banana pseudostem sap (S₁) recorded significantly higher grain as well as straw yield than rest of the treatments containing organic liquid formulations except treatment S₄. Similar results were also reported by Patil (2013). The interaction between different levels of organics N and organic liquid formulations sprays as well as control vs rest analysis did not show any significant variation in grain and straw yield of wheat crop.

Wheat quality

The quality parameters also differed significantly due to treatments containing different organic N levels and organic liquid formulations sprays (Table 1). The protein and dry gluten content in wheat grains were significantly increased with increase in application of RDF through BC:VC:CC as these

parameters were significantly increased with the application of 100% N through BC:VC:CC (O₃) over treatment O₁ but was remained on par with treatment receiving application of 75% N through BC:VC:CC (O₂). While, protein and dry gluten content were found significantly higher in the treatment containing spraying of 1% enriched banana pseudostem sap (S₁) which was found to be at par with treatment S₄. The increase in grain quality with the application of organic sprays might be due to better availability and uptake of nutrients especially nitrogen by wheat crop. Nitrogen is a main constituent of amino acid biosynthesis, hence higher nitrogen supply by organics results into formation of high protein content. These results are in conformity with Patil (2013) and Shah (2013). The quality parameters of wheat grains did not differ significantly due to interaction effect of different levels of organics N levels and organic liquid formulations sprays but in control vs rest analysis, significantly higher values were recorded with the application of organics over the chemical control. Higher protein and dry gluten content in this treatment might be due to better supply of nitrogen from the organic material which was responsible for higher biosynthesis of amino acid and helped in formation of protein. These results are in conformity with Patil and Bhilare (2000), Rekha Sethi *et al.* (2007), Randhe *et al.* (2009) and Patil (2013).

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