RESPONSE OF INTEGRATED NUTRIENT MANAGEMENT ON IRRIGATED WHEAT

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ABSTRCT

Wheat is one of the most staple foods of the Nepalese diet which is grown in the winter season in most of the area of the country. The study was carried out during *rabi* season of the year 2019-2020 at College Agronomy Farm, B.A.College of Agriculture, Anand Agricultural University, Anand (Gujarat) to study the response of Integrated Nutrient Management in irrigated wheat under sandy loam soil. Experimental soil is low in organic carbon (0.39 %) and medium in available phosphorus (37.22 kg/ha) and potassium (247 kg/ha) with slightly alkaline (pH 7.85) in reaction. Application of 75% RDN + 25% N through neem cake + *Jeevamrut* (500 lit/ha) treatment reported significantly higher growth attributes and yield attributes like plant height at 30 (25.76 cm), 60 (71.84 cm) DAS and at harvest (119.64 cm), length of spike (10.35 cm), number of effective (305) and total tillers (351), no of grains per spike (49.62). Wheat grain (6389 kg/ha) and straw yield (8950 kg/ha) were significantly higher in 75% RDN + 25% N through neem cake + *Jeevamrut* (500 lit/ha). Crude protein content (13.75 %), soil organic carbon (0.48%) and available phosphorus (53.52 kg/ha) was higher by application of 75% RDN + 25% N through neem cake + *Jeevamrut* (500 lit/ha). Soil microbial population after second and third irrigation was found to be significant by application of 50% RDN + 25% N through neem cake + NP consortium + *Jeevamrut* (500 lit/ha), while after first irrigation response of treatment on soil microbial population, soil pH and EC were found non-significant.

KEY WORD

Jeevamrut, *beejamrut,* Irrigated wheat, grain yield, neem cake and economics

INTRODUCTION

Wheat is a key staple food that provides around 20 percent of protein and calories consumed worldwide. Demand for wheat is projected to continue to grow over the coming decades, particularly in the developing world to feed an increasing population and with wheat being a preferred food, continuing to account for a substantial share of human energy needs in 2050.

Integrated nutrient management is practice where all the sources of nutrients namely organic, inorganic and bio-fertilizer as well as liquid organic manures can be combined and applied to soil so that crop growth is enhanced, and we can get good yield with quality product. Liquid organic manure, *jeevamrut* has the potential to play the role of promoting growth and providing resistance in the plant system. Descriptions of this holy combination could be traced to Vedas, the divine scripts of Indian wisdom. Application of *jeevamrut* in agriculture is a good option to supplement nutrient requirement of crops as it is easy to prepare, cost effective, easily available, more reliable and eco-friendlier.

Jeevamrut and *beejamrut* is a liquid organic manure popularly used as means of organic farming as well as integrated nutrient management system. It is excellent source of natural carbon, biomass, Nitrogen, Phosphorus, Potassium and lot of other forms of manure, compost and vermicompost. *Jeevamrut* established to be significant because it maintains the fertility of soil and helps in enhancement of growth and development of plants. *Jeevamrut* also comes in one of the low-cost formulations which are responsible for the enhancement of soil with indigenous micro-organisms required for better mineralization of soil and its helps in enhancement of growth of plant (Singh and Lal, 2019, Devakumar *et al.,* 2008 and Sreenivasa *et al.,* 2010

MATERIALS AND MATHODS

A field experiment was conducted at College Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand (Gujarat) during *rabi* season of the year 2019-20 to study the effect of integrated nutrient management in irrigated wheat. The soil of the experimental field was loamy sand in texture, medium in organic carbon (0.39 %) and medium in available phosphorus (37.22 kg/ha) and available potash (247 kg/ha) with slightly alkaline (pH 7.85) in reaction. Wheat variety Gujarat Wheat 451 (GW 451) was selected for experiment. The experiment was arranged in randomized block design with three replications, consisting of ten treatments **T_1**: 100% RDN through chemical fertilizer, **T_2:** 75% RDN + 25% N through neem cake, **T_3:** 75% RDN + 25% N through neem cake + NP consortium, **T_4:** 75% RDN + 25% N through neem cake + *Jeevamrut* (500 lit/ha), **T_5:** 50% RDN+ 50% N through neem cake, **T_6:** 50% RDN + 50% N through neem cake + NP consortium, **T_7:** 50% RDN + 50% N through neem cake + *Jeevamrut* (500 lit/ha), **T_8:** 50% RDN + 25% N through neem cake + NP consortium + *Jeevamrut* (500 lit/ha), **T_9:** 50% RDN + NP consortium + *Jeevamrut* (500 lit/ha), **T_{10}:** NP consortium + *Jeevamrut* (500 lit/ha). Recommended nitrogen (120 kg N/ha) was given in form of Urea at 50% as a basal and remaining 50% nitrogen in two splits at CRI (Crown root initiation) and tillering stage while recommended dose of phosphorus (60 kg P_2O_5/ha) in the form of Single Super Phosphate was applied as a basal. Application of bio NP consortium with seed treatment (5 ml/kg) and soil application (1 lit/ha) with first three irrigation as per treatments. Application of *jeevamrut* (500 lit/ha) at first three irrigation as per treatment. The collected data for various parameters were statistically analysed using Fishers analysis of variance (ANOVA) technique and the treatments were compared at 5% levels of significance (Steel and Torrie, 1982). All the observation, growth and yield parameters were taken as per standard method.

RESULTS AND DISCUSSION

Response of different integrated nutrient management treatments on plant population in meter row length was found non-significant at 20 DAS. Application of 75 % RDN + 25 % N through neem cake + *Jeevamrut* (500 lit/ha) reported significantly higher plant at 30, 60 DAS and at harvest (25.76,71.84 and 119.64 cm, respectively). Significantly higher plant might be due to organic manure could be attributed to slow release of nitrogen and increased availability of micro and macro nutrients available in neem cake to produce new meristematic tissues. Besides, NPK and micronutrients are also available in neem cake which plays a vital role in various metabolic activities of plants and catalytic role in activating several enzymes (Shivakumar *et al.*, 2011, Verma *et al.*, 2018 and Neelam *et al.,* 2015). The liquid organic manures contain microbial population and plant growth promoting substances that help in improving plant growth, metabolic activities of plants.

Application of 75% RDN + 25% N through neem cake + *Jeevamrut* (500 lit/ha) reported significantly higher length of spike (10.35 cm), effective and total tillers per meter row length (305 and 351, respectively), number of spikes per plant at harvest (10.40) and number of grains per spikes (49.62) but it did not differ significantly with treatment T_1 (100% RDN through chemical fertilizer). Response on growth attributing characters might be due to combined effect of organic manure, biofertilizers and chemical fertilizers in balanced proportion played a very important role in decomposition and easy release of different nutrients and their uptake by the crop which result into higher dry matter accumulation and its translocation in different plant parts of growth and yield parameters, which resulted into higher yield. *Jeevamrut* content major and micronutrient which are rapidly available and easily absorbed and helps in faster growth and development of plant component. Similar line of results was also reported by Desai *et al.,* 2015, Safiullah *et al.,* 2018 and Dalvi *et al.,* 2020. (Fig.02)

Data presented in Fig.03 revealed that significantly higher grain yield (6389 kg/ha) and straw yield (8950 kg/ha) was observed significantly higher in T_4 (75% RDN + 25% N through neem cake + *Jeevamrut* (500 lit/ha) treatment. Treatment T_4 (75% RDN + 25% N through neem cake + *Jeevamrut* (500 lit/ha) reported 6.16 % higher grain yield over 100 % RDF treatment (T_1). Significantly higher grain and straw yield by application of organic and inorganic nutrients might be due to supply of balanced amount of essential nutrients to plants in suitable proportion and forms. It is well established fact that the incorporation of organic manure not only acts as a store house of major and micronutrients but is also influence the physical, chemical and biological properties of soil (Yadav *et al.* 2009). Organic manure contains almost all the essential plant nutrients, its incorporation in soil in conjunction with inorganic fertilizers promotes rapid vegetative growth and tillering, thereby, increasing the sink size in terms of ear and grain growth. The application liquid manure supplied the required metabolites to the source and further greater accumulation of assimilates in the sink Dalvi *et al.*, 2020, Patel *et al*., 2013 reported that *jeevamrut* can release the nutrients in a more synchronized manner as per the need of the crops and *jeevamrut* enhances microbial activity in soil and helps in mobilization of nutrient in soil.

Protein content (13.75 %) was found to be significantly higher in treatment T_4 (75% RDN + 25% N through neem cake + *Jeevamrut* (500 lit/ha) than rest of integrated nutrient management treatments except treatment T_1 (100% RDN through chemical fertilizer). The response of treatment on soil pH and EC did not differ significantly by effect of various treatments. Application of 75% RDN + 25% N through neem cake + *Jeevamrut* (500 lit/ha(T_4) reported higher organic carbon (0.48 %) and available P_2O_5 (53.52 kg/ha). Soil microbial population was found non-significant at first irrigation, but it was significantly higher during second (148.44×106 cfu/g) and third irrigation (173.44 × 106 cfu/g) under treatment 50% RDN + 25% N through neem cake + NP consortium + Jeevamrut (500 lit/ha). Increasing microbial population might be due to availability of abundant organic matter and effective microbial activities because of sufficient supply of feeding material for microorganism in the form of humus. Similar finding reported by Pawar *et al.* (2013).

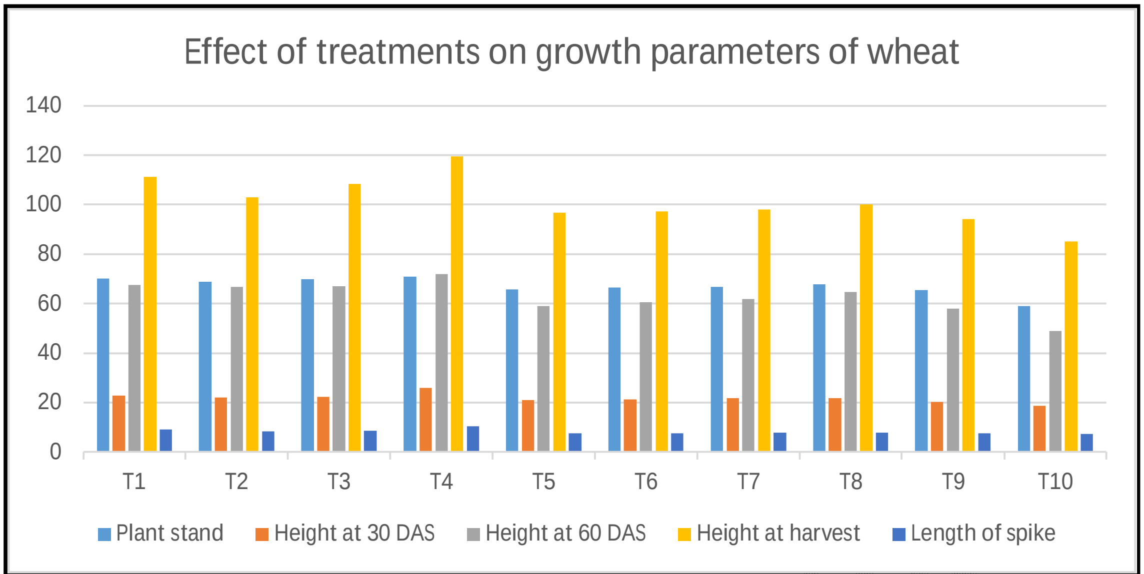

Fig. 01 Effect of treatments on growth parameters of wheat

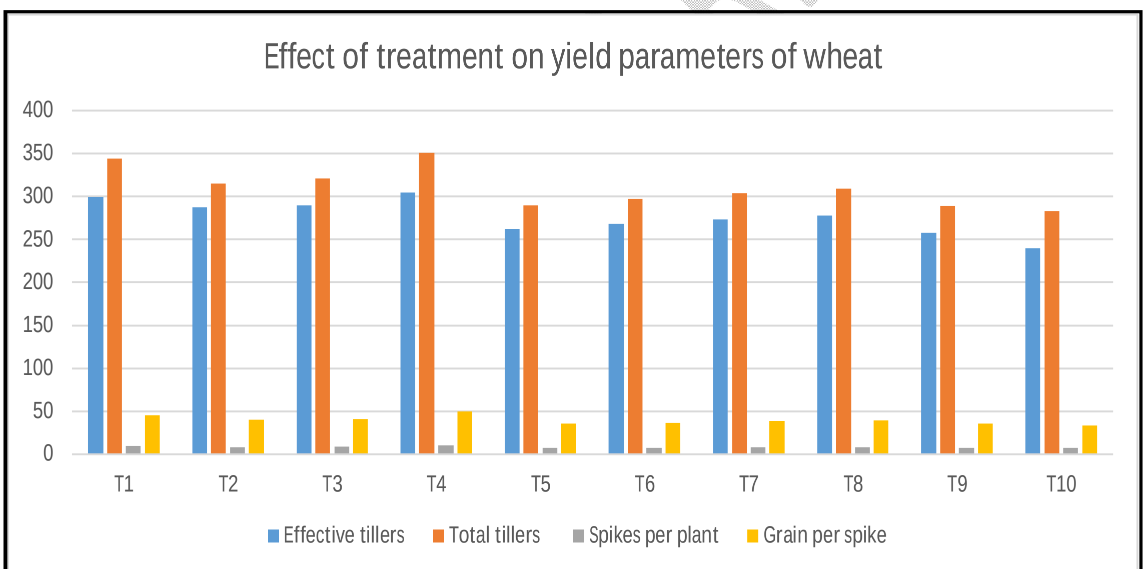

Fig. 02 Effect of treatment on yield parameters of wheat

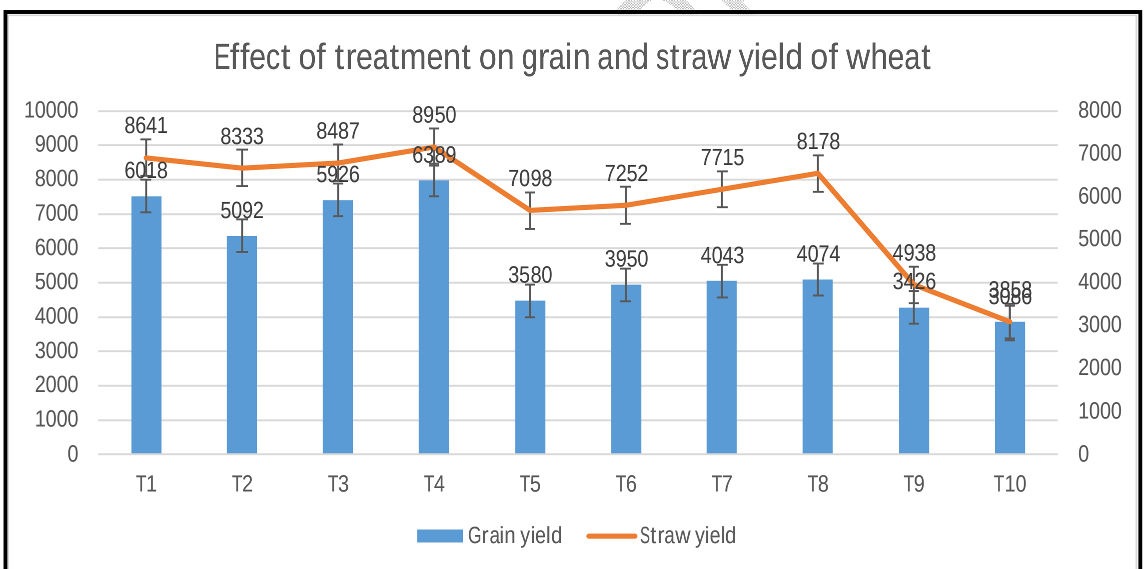

Fig. 03 Effect of treatment on grain and straw yield of wheat

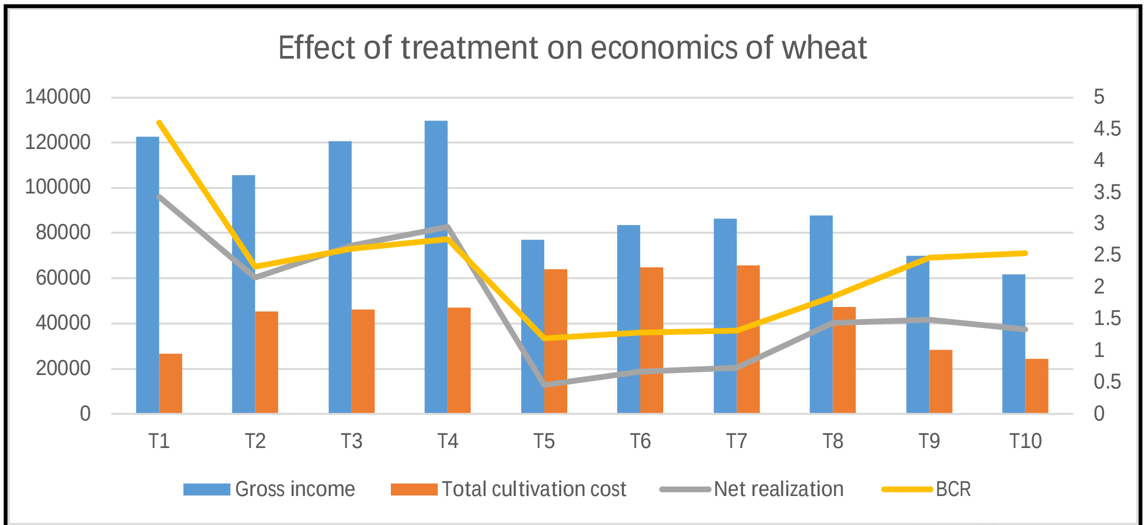

Fig. 04 Effect of treatment on economics of wheat

ECONOMICS

Based on present market prices of wheat seed and straw as well as different variable and non-variable inputs. The data on cost of cultivation, gross and net return as well as BCR were calculated for different treatments are presented in Fig.04. Application of treatment T_1 (100% RDN through chemical fertilizer) recorded higher net realization (Rs. 95907/ha) and BCR value (4.6) followed by application of treatment T_4 [75% RDN + 25% N through neem cake + *Jeevamrut* (500 lit/ha)] recorded net realization (Rs.82677/ha) and BCR value (2.76). However, lower net realization and BCR value recorded under application of treatment T_5 (50% RDN+ 50% N through neem cake).

CONCLUSION

Based on the above results, it can be concluded that the grain yield and economics of wheat can be improved by using different integrated nutrient management treatment. Experiment results also revealed that wheat morphological and physiological parameters improved by application of organic and inorganic with liquid manure.

Table: 01 Effect of treatment on protein content, soil microbial count and soil properties after harvest of crop

Treatment	Grain protein content (%)	Soil microbial count (× 106 cfu / g)			pH	EC	OC (%)	P_2O_5
		After 1st irrigation	After 2nd irrigation	After 3rd irrigation				
T_1	13.23	81.52	111.52	119.85	8.05	0.25	0.47	52.51
T_2	11.76	85.67	125.67	150.67	8.05	0.24	0.46	44.68
T_3	11.86	103.53	143.53	168.53	8.02	0.26	0.46	47.07
T_4	13.75	92.89	132.89	157.89	8.02	0.25	0.48	53.52
T_5	9.34	89.79	129.79	154.79	7.98	0.22	0.39	39.91
T_6	11.19	103.87	143.87	168.87	7.95	0.23	0.41	40.22
T_7	11.39	101.39	141.39	166.39	7.99	0.24	0.45	43.12
T_8	11.60	108.44	148.44	173.44	8.00	0.25	0.45	43.62
T_9	9.29	107.88	147.88	172.88	8.03	0.27	0.39	38.99
T_{10}	9.12	95.2	138.54	163.54	7.99	0.27	0.38	37.51
S. Em. ±	**0.57**	**6.23**	**6.78**	**7.29**	**0.26**	**0.01**	**0.02**	**1.86**
CD(P=0.05)	**1.69**	**NS**	**20.13**	**21.66**	**NS**	**NS**	**0.05**	**5.54**
CV %	8.76	11.12	8.61	7.91	5.61	8.85	6.51	7.32

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