Eco. Env. & Cons. 30 (Nov. Suppl. Issue) : 2024; pp. (S8-S11)

ISSN 0971–765X

DOI No. http://doi.org/10.53550/EEC.2024.v30i07s.002

Effect of sowing methods and nutrient management practices on growth and phenological parameters of organic wheat

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(Received 31 March, 2024; Accepted 3 June, 2024)

ABSTRACT

Field experiment was conducted during *rabi* season of 2021-22 and 2022-23 at Organic Farming Unit (Agronomy), Rajasthan College of Agriculture, MPUAT, Udaipur, India. The experiment comprised of three sowing methods and eight nutrient management practices thereby involving 24 treatment combinations which was replicated four times in split plot design. The FIRB sowing method recorded higher mean dry matter partitioning in leaves (8.12 %) and stem (32.37%) which was significantly higher over zero tillage sowing. Among nutrient management practices application of 50 % RDN through FYM as basal + 25 % RDN with 1st irrigation + 25 % RDN with 2nd irrigation + jeevamrit @ 500 l ha^{-1} at sowing and 1st irrigation + panchagavya @ 5 % at booting stage was recorded higher mean dry matter partitioning in leaves (8.37 %) and stem (33.31 %).

Key words : *Nutrient management, Organic wheat, Sowing methods*

Introduction

In the pursuit of sustainable agricultural practices, organic farming has emerged as a promising alternative to conventional methods. With its emphasis on soil health, biodiversity conservation, and reduced environmental impact, organic agriculture stands as a beacon for cultivating crops in harmony with nature. Among the staple crops, wheat holds a significant position globally, serving as a primary source of nutrition for millions. Enhancing wheat production through organic means not only aligns

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with ecological principles but also addresses consumer demand for healthier and environmentally friendly food choices. The notion of organic farming is gaining attraction, and demand for organic food is expanding swiftly in a number of countries, including India (Sharma *et al.,* 2021).

Central to the success of organic wheat cultivation are the methods employed for sowing and nutrient management. Sowing techniques play a pivotal role in establishing crop growth, affecting seed germination, root development, and overall plant vigor. The physico-chemical characteristics of soil cannot be sustained by traditional soil cultivation methods. The physical environment of soil is influenced by the methods used for sowing, which can consequently have an impact on plant rooting, soil nutrients, and moisture extraction patterns, all of which can impact crop establishment, growth, and yield (Mollah *et al.,* 2009).

Likewise, the application of organic amendments such as Farm Yard Manure (FYM) enriched with liquid organic manures like jeevamrit and panchgavya holds promise in providing essential nutrients while fostering soil microbial activity. In areas with a large number of livestock, manure from cattle and other animals is a significant source of nutrients.

Materials and Methods

Field experiment was conducted during *rabi* season of 2021-22 and 2022-23 at Organic Farming Unit (Agronomy), Rajasthan College of Agriculture, MPUAT, Udaipur, India. The experiment comprised of three sowing methods (Flat row sowing, FIRB sowing and Zero tillage sowing) and eight nutrient management practices (100 % RDN through FYM as basal; RDN through FYM as basal + 50 % RDN with 1st irrigation; 75 % RDN through FYM as basal + 25 % RDN with 1st irrigation; 50 % RDN through FYM as basal + 25 % RDN with 1st irrigation + 25 % RDN with 2nd irrigation; 100 % RDN through FYM as basal+ jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation + panchagavya @ 5 % at booting stage; 50 % RDN through FYM as basal + 50 % RDN with 1st irrigation + jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation + panchagavya @ 5 % at booting stage; 75 % RDN through FYM as basal + 25 % RDN with 1st irrigation + jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation + panchagavya @ 5 % at booting stage and 50 % RDN through FYM as basal + 25 % RDN with 1st irrigation + 25 % RDN with 2nd irrigation + jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation + panchagavya @ 5 % at booting stage) thereby involving 24 treatment combination whichwas replicated four time in split plot design. The wheat variety Raj-4079 was sown on 16 November in 2021 and 18 November in 2022.

The ability of a plant to amass photosynthate in a specific area is known as "dry matter partitioning" (each has specific function and value). At harvest, a 0.5 m row length sample of each plot's plants was taken. The sample's stem and leaves were then separated, weighted individually, and expressed as a percentage. Half of the plants in each plot reached flowering, and this was noted. The days required for 50% flowering were calculated starting on the date of seeding.

Results

Dry matter partitioning in leaves

The highest dry matter partitioning in leaves and stem of organic wheat were recorded with FIRB sowing method which was significantly higher over zero tillage sowing method. However, its effect was found at par with flat row sowing method during both the years. On pooled data basis, FIRB sowing method significantly increased dry matter partitioning of organic wheat by 7.32 and 8.77 per cent in leaves and stem, respectively as compared to zero tillage sowing. However, effect of this treatment remained at par with flat row sowing methods. Among nutrient management practices split application of RDN through only FYM, on the basis of pooled data the highest dry matter partitioning in leaves and stem of organic wheat were recorded with application of 75 % RDN through FYM as basal + 25 % RDN with 1st irrigation which was significantly higher by 8.14 and 7.93 per cent, respectively over application of 100 % RDN through FYM as basal. However, its effect was found at par with application of 50 % RDN through FYM as basal + 50 % RDN with 1st irrigation and50 % RDN through FYM as basal + 25 % RDN with 1st irrigation + 25 % RDN with 2nd irrigation.In case of split application of RDN through only FYM with jeevamrit and panchgavya, the highest dry matter partitioning in leaves and stem of organic wheat were recorded with application of 50 % RDN through FYM as basal + 25 % RDN with 1st irrigation + 25 % RDN with 2nd irrigation + jeevamrit @ 500 L ha^{-1} at sowing and 1st irriga-

Table 1. Effect of sowing methods and nutrient management practices on dry matter partitioning in leaves and stem and on days to 50% flowering in organic wheat

Treatments	Dry matter partitioning in leaves (%)			Dry matter partitioning in stem (%)			Days to 50 % flowering		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Sowing methods									
S_1- Flat Row Sowing	7.69	8.36	8.03	31.54	31.69	31.61	77.24	78.02	77.63
S_2- FIRB	7.74	8.49	8.12	31.73	33.01	32.37	78.24	77.34	77.79
S_3- Zero Tillege	7.19	7.87	7.53	29.47	30.06	29.76	77.97	77.13	77.55
SEm±	0.10	0.09	0.07	0.41	0.44	0.30	1.05	1.10	0.76
C.D. at 5%	0.35	0.30	0.20	1.41	1.54	0.93	NS	NS	NS
Nutrient management practices									
M_1-100 % RDN through FYM as basal	6.94	7.79	7.37	28.47	30.02	29.24	77.05	75.06	76.05
M_2-50 % RDN through FYM as basal + 50 % RDN with 1st irrigation	7.50	8.08	7.79	30.75	31.56	31.15	77.40	78.04	77.72
M_3-75 % RDN through FYM as basal + 25 % RDN with 1st irrigation	7.65	8.23	7.94	31.34	31.77	31.56	78.37	78.29	78.33
M_4-50 % RDN through FYM as basal + 25 % RDN with 1st irrigation + 25 % RDN with 2nd irrigation	7.45	8.03	7.74	30.56	30.38	30.47	74.84	75.01	74.92
M_5-M_1 + Jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation + Panchagavya @ 5 % at booting stage	7.26	8.29	7.77	29.75	30.99	30.37	76.79	77.47	77.13
M_6-M_2 + Jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation +Panchagavya @ 5 % at booting stage	7.89	8.49	8.19	32.33	32.75	32.54	78.70	77.57	78.14
M_7-M_3 + Jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation + Panchagavya @ 5 % at booting stage	8.07	8.67	8.37	33.07	33.55	33.31	80.80	79.40	80.10
M_8-M_4 + Jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation + Panchagavya @ 5 % at booting stage	7.57	8.37	7.97	31.04	31.67	31.35	78.56	79.13	78.85
SEm±	0.15	0.12	0.09	0.61	0.53	0.41	1.27	1.31	0.91
C.D. at 0.05	0.42	0.33	**0.26**	1.73	1.50	**1.13**	NS	NS	NS

tion + panchagavya @ 5 % at booting stage which was significantly higher by 7.72 and 5.01 & 9.68 and 6.25 per cent over application of 100 % RDN through FYM as basal + jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation + panchagavya @ 5 % at booting stage and 50 % RDN through FYM as basal + 25 % RDN with 1st irrigation + 25 % RDN with 2nd irrigation + jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation + panchagavya @ 5 % at booting stage, respectively on the basis of pooleddata.

Day to 50 % flowering

Days to 50 % flowering did not influenced significantly by sowing methods and nutrient management practices during both the years as well as on pooled basis.

Discussion

Results showed that FIRB sowing method resulted in significantly higher dry matter partitioning in leaves and stem of organic wheat than flat row and zero tillage sowing. This might be due to vigorous and timely germination of seeds in FIRB sowing than other sowing methods. Low germination in zero tillage lead to less competition among the plants, hence supported horizontal expansion to utilize the available space resulting in dwarf plants than conventional method (Bhardwaj *et al.*, 2010 and Chouhan *et al.*, 2017). FIRB sowing method

provided better environment for wheat growth and development, where water was used more efficiently, and also caused an increase in photosynthetic potential (Wang *et al.*, 2004). Among nutrient management practices application of treatment M_7 (75 % RDN through FYM as basal + 25 % RDN with 1st irrigation + jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation + panchagavya @ 5 % at booting stage) had significant effect dry matter partitioning in leaves and stem of organic wheat. The effect of split application of RDN with and without panchgavya and jeevamrit plays a major role in enhancing the growth of crop due to supplying plant nutrients along with spurn (micro) nutrients and also due to synergistic effect with other nutrients (Meena *et al.*, 2017).

Conclusion

The FIRB sowing methods exhibited superior performance in terms of dry matter partitioning in leaves and stem of organic wheat, indicating vigorous and timely germination of seeds with less competition in FIRB sowing method. Among the different nutrient management practices, application of 75 % RDN through FYM as basal + 25 % RDN with 1st irrigation + jeevamrit @ 500 L ha^{-1} at sowing and 1st irrigation + panchagavya @ 5 % at booting stage emerged as most effective approach, enhancing the growth of crop due to supplying plant nutrients along with micro nutrients.

Conflict of Interest- None

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