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Response on growth performance of wheat (*Triticum aestivum* L.) under the rhizospheric management

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Abstract
A field experiment entitled "Response of rhizospheric management on soil health and nutrient use efficiency in wheat (*Triticum aestivum* L.)" was conducted during *rabi* season of 2017-2018 at G.B Pant University of Agriculture and Technology, Pantnagar, District, Udham Singh Nagar (Uttarakhand). The experiment was conducted with 19 treatment combinations and 3 replications in a factorial randomized block design. The treatments were consisted of 3 different placement methods *viz*: Deep placement, surface application and Band placement, Six nutrient management options *viz*: 100% RDF (150:60:40 kg/ha NPK), 75% RDF (112.5:45:30 kg/ha NPK), 75% RDF +Vermicompost (2 q/ha), 75% RDF +Vermicompost (2 q/ha) +PSB (10 kg/ha), 75% RDF + Poultry manure (2 q/ha), 75% RDF + Poultry manure (2 q/ha) +PSB (10 kg/ha) with one absolute control. Results suggested that among the different placement methods; Deep placement performed significantly better over rest of the treatments in all the growth performance *viz*: Plant height (cm) and dry matter production (g/m^2). However, it was found at par with Band placement. Among the nutrient management treatment, 75% RDF + Vermicompost+ PSB found to be significantly superior in growth of wheat to the rest of the nutrient management options. It was also found at par with 100% RDF and 75 % RDF+ Poultry manure+ PSB. Absolute control plot recorded the lowest improvement in growth. Combined application of Deep placement and 75% RDF+ Vermicompost +PSB or 75% RDF + poultry manure + PSB was found to be the best treatment as they resulted in growth enhancement. Considering widespread low nutrient use efficiency of fertilizers, rhizospheric manipulation with fertilizer placement and nutrient management approach can help in improving growth performance with a reduction in the rate of fertilizers. The addition of organic matter into the soil maximized the rhizospheric efficiency and nutrient use efficiency of wheat.

Keywords: Rhizospheric management, wheat, growth performance, fertilizer placement and nutrient management

Introduction

Wheat is the second most important staple food crop after rice that is used by one 1/3 world population for consumption to satisfy their hunger. With increasing demand of food and world population, the use of chemical fertilizer increases higher rate proportionately to food production, it was attributed to reduction of soil health due to excessive use of fertilizer and ignoring biological potential of soil. so the rhizospheric management provided he unique opportunity of harmonizing the crop performance and soil health with reduction of environmental pollutions. It can be done with the improvement of root and rhizospheric interaction. The nutrient inputs is the integral part to achieving the high crop yield and high nutrient use efficiency with maximizing rhizosphere process and root architecture (Wang *et al*., 2013; and Shen *et al*., 2012) [18]. In the rhizospheric management, small modification in rhizosphere processes resulted maximum output as stated by the Indian proverb "to lever a ton weight with an ounce force." The rhizospheric management strategies were also achieved by accelerating the biological potential of rhizospheric soil for maximizing the crop nutrient use efficiency than solely depending on application of chemical fertilizers. Fertilizer applications were used to optimizing the root development and rhizosphere processes to increase the rhizospheric nutrient capture (Wu *et al*., 2017; Hartmann *et al*., 2015) [20, 2]. The rhizospheric management strategies reflected a shifting from the conventional nutrient management to manipulation of the root architectural development and rhizosphere processes for enhancing nutrient use efficiency and crop productivity. The development of the integrated rhizospheric management with best crop-soil management was an effective approach to achieve the maximum nutrient use efficiency, high crop productivity, and reduced resource use and reduction in environmental influence (Zhang *et al*., 2010) [21]. Rhizosphere processes reflected the non-discriminatory interactions among plants, soils, and microbiome in crop ecosystems. In agricultural ecosystems, these rhizospheric processes determine the exchange of matter and energy between plants and soils and thus influence the crop productivity and system stability (Shen *et al*., 2013) [15]. Limited rhizospheric research suggested that the rhizospheric processes and interactions were playing an importance role to understanding the mechanisms of nutrient dynamics and rhizosphere biochemical processes in the plant ecosystem. So, the management of rhizospheric ecosystems and processes may be one of the most crucial approach to increasing the nutrient use efficiency and crop productivity (Panhwar *et al*., 2019 and Zhang *et al*., 2010) [12, 21]. The rhizosphere management described the modification/management of various factors of the rhizosphere ecosystems thus optimizing rhizospheric interactions focused on to develop the better understanding of rhizosphere processes. These strategies for rhizospheric management were providing an opportunity to enhancing the bioavailability of nutrients (e.g., P, Zn, and Fe) with fertilizer placement. The modifying the root exudation, driving mycorrhizal fungi and other beneficial microbiome and intensifying rhizospheric interactions were improve the nutrient use efficiency due to localized fertilizer application (Li *et al*., 2010 and Jiao *et al*., 2016) [11, 4]. Rhizosphere management strategies are includes the integrated modification of internal and external factors with synchronizing the plant genetic potential to nutrient input application to the soil environment (Wu *et al*., 2017; Panhwar *et al*., 2019) [20, 12]. Rhizospheric nutrients dynamics reflected the soil nutrient supply and bioavailability thus affected the crop production in agricultural systems. In traditional fertilizer application in India, people have been solicitous with accelerating nutrient concentrations in the soil solution by excessive fertilizers application but have neglected the rhizospheric potential (Zhang *et al*., 2011). The rhizosphere management strategies were prerequisite the optimizing of the nutrient application at certain crops growth stages, synchronizing the rhizosphere nutrient supply and crop nutrient demands. The accelerating root growth at early stages can promote the nutrient mobilization of soil and improving root systems establishment at later stages crop. The rhizosphere management strategies can focus on increasing the efficiency of root and rhizosphere processes in nutrient uptake toward high-yield, high use efficiency and sustainable crop production. This can be possible through the optimizing nutrient supply in the rhizosphere, controlling the root development, and modifying the rhizosphere interactions.

The rhizospheric nutrient application directly influences the root growth at different crop growth stages. Therefore, the manipulation of root efficiency and rhizosphere processes can provide a unique opportunity to enhance the nutrient use efficiency and crop productivity. The rhizospheric management can emphasize on the following aspects: (i) exploiting and understanding rhizosphere processes with the aim of helping to resolve the problems in Indian crop production, (ii) taking full advantage of the biological potential of crops in efficient acquisition and utilization of nutrients as the breakthrough point, (iii) manipulating the rhizosphere nutritional environment as the core, and (iv) combining with the integrated best plant-soil managements (Shen *et al*., 2013 and Jiao *et al*., 2016) [15, 4]. This required the dynamically assessing the rhizospheric nutrient concentrations at different stages of crop growth to know the synchronization of crop nutrient acquisition, soil nutrient application, and fertilizer use. This novel approach give a practical pathway for controlling the profound conflicts among high-yielding crops, efficient use of nutrients, and environmental safety.The overall goal of rhizosphere management is to increase nutrient use efficiency, improve crop yields, reduction in mineral fertilizer inputs, and achieve sustainable crop production by optimizing and integrating a range of beneficial rhizosphere interactions.

Material and Methods

The experiment was laid out in Factorial Randomized Block Design with one extra treatment with three replications. The experimental soil characterized as silty clay loam with medium in nitrogen and potassium and medium in phosphorus content. Treatment details given are table no. 1. In the beginning of the experiment, the good tilth soil was the prerequisite for better allocation of experimental treatments (fertilizer placement and nutrient application) and good crop stand. So, field was twice harrowed with disc harrow, once planked and rotavated for preparation of good seed bed. Thereafter, experimental plot was marked and divided into plots for treatment allocations and sowing of wheat crop. The treatments were consisted of three fertilizer placement method and 6 nutrient management treatments keeping N-P-K nutrient at 75 and 100 per cent of recommended level with or without organic manure. The recommended dose of NPK nutrients was 150-60-40 kg N- P_2O_5 -K_2O/ ha. In all 18 treatments basal dose of fertilizers mixture was applied at the surface, between the rows and beneath the seed rows which is shown in figure 3.4. The 50% dose of fertilizers N and full dose of P_2O_5 and K_2O were used for fertilizer placement as basal dose. Remaining 50% of N was used for top dressing during CRI stage and at late jointing stage with irrigation. One extra treatment was used as absolute control. The agronomic practices such as intercultural operations were same in all the plots of experiment. These prepared fertilizer mix was applied according to treatments at the time of placement of fertilizers. After the fertilizers placement, sowing was done manually seed placing in furrows (20 cm apart) opened with tractor drawn furrow opener and closed the furrows by tractor drawn roller for better soil contact and plant establishment. After that, plots and irrigation channels were made through forming bunds by tractor drawn bund former.

Table 1: Treatment details of the experimental plot.

Location of experiment	D-3 block, wheat agronomy, Norman E. Borlaug Crop Research Centre of G.B. Pant University of Agriculture and Technology, Pantnagar,
Season and year	Rabi seasons of 2017-18
Crop	Wheat
Variety	WH-1105
Seed rate	100 kg ha^{-1}
Experimental design	Factorial Randomized Block Design (FRBD)
Replications	3
No. of factors	2
Levels of factors	Placement methods = 3 Nutrient management = 6 Absolute control = 1
Total no. of Treatment combinations	3 × 6+1 = 19
Total no. of plots	19 × 3 = 57
Crop geometry	Row to Row distance = 20 cm
Gross Plot size	7.30m x1.8m = 13.14 m^2
Net plot size	6.80 m x 1.4 m = 9.52 m^2

Growth studies
For recording emergence count, plant height and number of shoots, two 1m length rows were marked in the 2^{th} row of each plot on both sides diagonally. Plant height and plant dry matter accumulation was recorded at 30, 60, 90, 120 DAS.

Plant height (cm)
Ten randomly selected plants from sampling rows were tagged and used for periodic plant height observations. At every 30 days interval, the heights of these plants were measured from ground level to tip of flag leaf to calculate the average plant height (cm).

Dry matter accumulation (g/m^2)
The second row from each side was used to dry matter studies where one meter row lengths of wheat plant were cut down, oven dried at 65^{0}C temperature for 24 hrs or till constant weight arrived. The dry weight was expressed into the g/m^2 after the converting by row spacing calculations.

Growth analysis
The plant photosynthetic assimilatory pattern was computed by using growth analysis formula.

Leaf area index (LAI)
The leaf area determination was done from the leaves striped from the samples for the dry matter accumulation. The whole leaf was striped from base and leaf area measured through leaf area meter (Model LI-COR-3100). On the basis of row spacing, leaf area was expressed in leaf area per meter^2. Leaf area index (LAI) was expressed the ratio of total leaf area to ground occupied by plants. LAI was calculated by using the following formula:

$$\text{Leaf area index (LAI)} = \frac{\text{Total leaf area}}{\text{total ground area}}$$

The LAI was measured 4 times during the experimental trial at 30 DAS, 60 DAS, 90 DAS and 120 DAS of wheat crop.

Crop growth rate (CGR)
It represents dry weight grained in a unit time from unit land area. It was calculated by following formula:

$$\text{CGR (g/m2/day)} = \frac{(\text{W2} - \text{W1})}{(\text{T2} - \text{T1})}$$

Where, W_2 and W_1 are the recorded plant dry matter weight (g/m^2) at time T_2 and T_1, respectively. T_2 and T_1 are the time recorded in days. It was calculated for four intervals 0 to 30 DAS, 30 to 60 DAS, 60 to 90 DAS and 90 DAS to 120 DAS stage of crop and was expressed as g/m^2/day.

Result and discussion
The data recorded on different treatments during the course of investigation were subjected to statistical analysis and the results obtained along with suitable interpretations have been presented and elucidated in the chapter through tables and figures wherever required.

Plant height (cm)
The data pertaining to plant height of wheat at various stages (30, 60, 90, 120 DAS and at harvest) under different fertilizer placement methods and nutrient management are embodied in table 2.

With the advancement of crop age, there was a progressive increase in the plant height and the maximum value reached at harvest. Different fertilizer placement methods and nutrient management was influence the plant height significantly at various crop growth stages (60, 90, 120 DAS and at harvest). However, fertilizer placement did not significantly influence plant height at 30 DAS due to uniform soil environment and nutrient supply but later growth stages plant height significantly influenced by placement methods due to better availability of nutrient and manipulation of soil environment. At 60DAS, deep placement (55.7 cm) and band placement (53.9 cm) was recorded significantly at par in plant height and followed by surface application (47.8 cm). Lowest plant height was recorded with surface application (80.7 cm) and at par with band application (84 cm) which was also at par with deep placement (98.2 cm) at 90 DAS, 120 DAS and at harvest, respectively. But, deep placement (99.3 cm) and band placement (96.3 cm) were observed at par with each other and followed by surface application (96.3 cm) in plant height at 120 DAS and at harvest, respectively. The deep placement recorded more plant height because more photosynthates accumulation due to long term bioavailability of nutrients, root proliferation and improved soil and biological potential of rhizosphere (Radhika *et al*., 2013 and Kaleem *et al*., 2009) [13, 6]. Similar trend in plant height also observed by Chen *et al*., 2016; Silwana *et al*., 2007 and Rahim *et al*., 2012 [1, 16, 14].

In case of Nutrient management, highest plant height was recorded with 75% RDF + VC+ PSB (103.8 cm) at harvest. At 30 DAS, nutrient management was recorded non significant effect on plant height. At 60 DAS, 75% RDF + Vermicompost + PSB (56.8 cm) recorded significantly higher plant height followed by 75 % RDF+ PM + PSB (55.2 cm), 100 % RDF (54.9 cm), 75 % RDF + VC (52.8 cm), 75 % RDF + PM (47.8 cm) and 75 % RDF (47.5 cm), respectively. Similar trend in plant height also found in plant height at 90 DAS, 120 DAS and at harvest. Kaleem *et al*. (2009); Chen *et al*., (2016) and Rahim *et al*., (2012) [6, 1, 14] were found similar findings in nutrient management due to better nutrient supply and utilization by wheat which favourably influence by root proliferation.

In case of control vs rest, both treatments of fertilizer placement and nutrient management recorded significantly superior plant height over control at all crop growth stages. Lowest plant height in control was due to low nutrient availability.

The Non-significant interaction effect of fertilizer placement methods and nutrient management was recorded on plant height in wheats.

Dry matter accumulation (g)

The data pertaining to dry matter accumulation of wheat at various stages (30, 60, 90, 120 DAS and at harvest) under different fertilizer placement methods and nutrient management are furnished in table 3.

With the advancement of crop age, there was a progressive increase in the dry matter accumulation and the maximum value reached at harvest. In fertilizer placement methods were affecting the dry matter accumulation of wheat significantly. Fertilizer placement did not significantly influence plant dry matter accumulation at 30 DAS due to uniform soil environment and nutrient supply but later growth stages dry matter accumulation significantly influenced by placement methods due to better availability of nutrient and manipulation of soil environment. At 60DAS, deep placement (300.2 g) and band placement (285 g) was recorded significantly at par in dry matter accumulation and followed by surface application (269.5 g). Lowest dry matter accumulation was recorded with surface application (895.4 g) compared to band application (935.2 g) which was also at par with deep placement (954.2 g) at 90 DAS, 120 DAS and at harvest, respectively. But, deep placement (979.9 g) and band placement (965.7, cm) were observed at par with each other and followed by surface application (901.5 g) in dry matter accumulation at 90 DAS, 120 DAS and at harvest, respectively. High concentration of solute at fertilizer placement sites were inhibited nitrification due to osmotic potential of the solutes thus provides long term bioavailability of nutrients (Chen *et al*., 2016); Wu *et al*. (2017); Hossain *et al*., (2018) and Kapoor *et al*., (2008) [1, 20, 3, 7] who reported that broadcasting of fertilizer caused increasing in the fertilizer losses and reduction in fertilizer use efficiency than fertilizer placement. The localized supply regulates root development and modifies the physico- chemical processes of the rhizospheric environment (Jing *et al*., 2010) [5]. Plant roots were influenced the rhizospheric interfaces through physiological and metabolic activities to enhance the phosphorus availability of soil (Kumar *et al*., 2019a and Weligama *et al*., 2008) [9, 19].

The dry matter production was significantly influenced by different nutrient management s. In case of Nutrient management, highest dry matter accumulation was recorded with 75% RDF + VC+ PSB (1212.6 g) at harvest. At 30 DAS, nutrient management was recorded non significant effect on dry matter accumulation. At 60 DAS, 75% RDF + Vermicompost + PSB (307.7 g) recorded significantly higher dry matter accumulation followed by 100 % RDF (298.6 g), 75 % RDF+ PM + PSB (286.2 g), 75 % RDF + VC (283.6 g), 75 % RDF + PM (271 g) and 75 % RDF (262.3 g), respectively. Similar trend in dry matter accumulation also found at 90 DAS and 120 DAS. At harvest, deep placement (1216.5) was gain significantly maximum plant dry matter accumulation followed by 75 % RDF+ PM + PSB (1189.2 g), 100 % RDF (1177.9 g), 75 % RDF + VC (1173.3 g), 75 % RDF + PM (1166.9 g) and 75 % RDF (1031.3 g), respectively. Similar findings also reported by Rahim *et al*., (2012) [14]. The higher dry matter accumulation of wheat under 75% RDF + Vermicompost + PSB might be attributed to increased plant height (table 2) and the better rhizospheric and soil moisture conditions which led to better root growth which in turn, resulted in better nutrient and water uptake, thus, recorded maximum dry matter production (Weligama *et al*., 2008; Jing *et al*., 2010 and Kumar *et al*., 2019b) [19, 5, 8]. The direct addition of organic manure in the soil increased organic carbon content, to which stimulated the growth and activity of microorganisms which leads to better root growth, resulting in the higher production of biomass.

In case of control, dry matter accumulation recorded significantly minimum in control treatment than both the treatment of fertilizer placement and nutrient management. The non significant responses of fertilizer placement methods and nutrient management interaction were recorded on dry matter accumulation of wheat at all crop growth stages s.

Plant growth indices

Different growth indices such as- leaf area index (LAI) and crop growth rate (CGR), were estimated on the basis of plant growth observations viz. leaf area and dry matter recorded at various growth stages in wheat (Table 4). The LAI trend showed increasing trend from 30 to 90 DAS, after that it was decreased from 90 to 120 DAS. Similar trend was observed for CGR during the crop growth period.

Almost similar values of all these growth indices were recorded under placement methods; which indicate that the inability of these methods to affect significantly the growth of wheat. Application of 75% RDF combined with VC and PSB recorded higher values of LAI, and CGR at all the crop growth stages as compared to 75% RDF alone and other combinations The direct addition of organic manure in the soil increased organic carbon content, to which stimulated the growth and activity of microorganisms which leads to better root growth, resulting in the higher production of biomass (Singh *et al.* 2011 and Kumar *et al.* 2019b) [17, 8]. Similar results also suggested by Silwana *et al*., (2007) [16] and Radhika *et al*., (2013) [13]. Kumar *et al*., (2019a) [9] has been reported the importance of nutrient management including chemical fertilizers and organic nutrient sources either organic manure to improve the morpho- physiological traits in wheat viz. leaf area index, leaf chlorophyll content, photosynthetic efficiency; which were created by the improvement in soil properties. The direct addition of organic manure in the soil increased organic carbon content, to which stimulated the growth and activity of microorganisms which leads to better root growth, resulting in the higher production of biomass, crop stubbles and residues (Singh *et al*. 2011 and Kumar *et al*., 2019b) [17, 8].

In case of control vs rest, control showed significantly lowest value of LAI,and CGR, compared to rest of the treatment. All the interaction effects of treatments in concern of these growth indices were found to be non significant at different crop growth stages.

Conclusion

From above findings, it concluded that Rhizospheric management with fertilizer placement and nutrient management options proved to be efficient in improving crop growth performance *viz* plant height, dry matter production and leaf area index of wheat. It might be due to the improved rhizospheric efficiency like as biotic potential of rhizosphere, nutrient acquisition and healthy soil under wheat production system. Future study will be needed to explore the understanding about the rhizosphere management

Table 2: Effect of rhizospheric management on plant emergence and plant height in wheat

Treatments	Plant height (cm)				
	30 DAS	60 DAS	90 DAS	120 DAS	At harvest
Placement methods					
Deep placement	18.2	55.7	89.2	98.6	101.7
Surface application	16.7	47.8	80.7	92.1	94.6
Band placement	17.6	53.9	84.0	95.2	98.2
SE.m. ±	0.4	1.4	1.5	1.2	1.3
CD (P=0.05)	NS	4.0	4.2	3.6	3.6
Nutrient management					
100% RDF (150:60:40 kg/ha NPK)	17.2	54.9	85.6	95.4	97.1
75% RDF (112.5:45:30 kg/ha NPK)	16.5	47.5	78.5	90.5	92.8
75% RDF + VC (2q/ha)	17.8	52.8	84.5	96.2	98.1
75% RDF + VC(2q/ha) + PSB (10kg/ha)	18.0	56.8	88.7	98.7	103.1
75% RDF + PM(2q/ha)	17.4	47.8	83.8	94.3	96.7
75% RDF + PM (2q/ha)+ PSB (10 kg/ha)	17.9	55.2	86.6	96.7	101.2
SE.m. ±	0.6	2.0	2.1	1.8	1.8
CD (P=0.05)	NS	5.7	5.9	5.0	5.1
Interaction effect					
SE.m. ±	1.1	3.4	3.6	3.0	3.1
CD (P=0.05)	NS	NS	NS	NS	NS
Control vs rest					
Control	16.9	22.4	57.3	68.8	69.9
Rest	17.5	52.5	84.6	95.3	98.2
SE.m. ±	0.8	2.5	2.6	2.2	2.2
CD (P=0.05)	NS	7.2	7.4	6.3	6.4
C.V. (%)	10.7	11.7	7.4	5.6	5.5

Table 3: Effect of rhizospheric management on plant dry matter accumulation in wheat

Treatments	Plant dry matter accumulation (g/m^2)				
	30 DAS	60 DAS	90 DAS	120 DAS	At harvest
Placement methods					
Deep placement	30.1	300.2	954.2	1180.4	1203.0
Surface application	27.9	269.5	895.4	1092.5	1098.1
Band placement	29.6	285.3	935.2	1155.6	1176.5
SE.m. ±	0.6	5.2	16.3	17.2	26.3
CD (P=0.05)	NS	15.0	46.7	49.4	75.6
Nutrient management					
100% RDF (150:60:40 kg/ha NPK)	28.9	298.6	958.7	1147.7	1177.9
75% RDF (112.5:45:30 kg/ha NPK)	28.5	262.3	841.9	1025.0	1031.3
75% RDF + VC (2q/ha)	29.0	283.6	931.6	1162.8	1173.3
75% RDF + VC(2q/ha) + PSB (10kg/ha)	30.8	307.7	977.6	1188.8	1216.5
75% RDF + PM(2q/ha)	28.1	271.0	903.4	1130.3	1166.9
75% RDF + PM (2q/ha)+ PSB (10 kg/ha)	29.8	286.2	956.3	1202.3	1189.2
SE.m. ±	0.9	7.4	23.0	24.4	37.3
CD (P=0.05)	NS	21.2	66.0	69.8	106.9
Interaction effect					
SE.m. ±	1.6	12.8	39.9	42.2	64.5
CD (P=0.05)	NS	NS	NS	NS	NS
Control vs rest					
Control	18.5	142.5	413.6	562.2	320.1
Rest	29.2	284.9	928.3	1142.8	1159.2
SE.m. ±	1.1	9.3	29.0	30.6	46.9
CD (P=0.05)	3.3	26.7	83.0	87.9	134.5
C.V. (%)	9.5	8.0	7.7	6.6	10.0

Table 4: Effect of rhizospheric management on plant leaf area index and CGR in wheat

Treatments	Leaf Area Index				CGR (g/m^2/day)		
	30 DAS	60 DAS	90 DAS	120 DAS	30-60	60-90	90-120
Placement methods							
Deep placement	0.33	2.69	3.62	1.15	9.01	21.80	7.54
Surface application	0.30	2.41	3.36	1.02	8.05	20.86	6.57
Band placement	0.31	2.55	3.54	1.10	8.51	21.67	7.35
SE.m. ±	0.01	0.05	0.07	0.02	0.17	0.44	0.33
CD (P=0.05)	NS	0.14	0.20	0.06	0.49	NS	NS
Nutrient management							
100% RDF (150:60:40 kg/ha NPK)	0.31	2.67	3.63	1.10	8.99	22.01	6.30
75% RDF (112.5:45:30 kg/ha NPK)	0.28	2.36	3.13	1.00	7.79	19.32	6.10
75% RDF + VC (2q/ha)	0.30	2.55	3.51	1.10	8.49	21.60	7.71
75% RDF + VC(2q/ha) + PSB (10kg/ha)	0.34	2.75	3.70	1.14	9.23	22.33	7.04
75% RDF + PM(2q/ha)	0.31	2.43	3.42	1.08	8.10	21.08	7.56
75% RDF + PM (2q/ha)+ PSB (10 kg/ha)	0.32	2.55	3.63	1.12	8.55	22.34	8.20
SE.m. ±	0.02	0.07	0.10	0.03	0.24	0.63	0.47
CD (P=0.05)	NS	0.20	0.28	0.09	0.70	1.80	1.35
Interaction							
SE.m. ±	0.03	0.12	0.17	0.05	0.42	1.09	0.82
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS
Control vs rest							
Control	0.14	1.28	1.56	0.48	4.13	9.04	4.35
Rest	0.31	2.55	3.51	1.09	8.52	21.45	7.15
SE.m. ±	0.02	0.09	0.12	0.04	0.31	0.79	0.59
CD (P=0.05)	0.06	0.25	0.35	0.11	0.88	2.27	1.70
C.V. (%)	15.8	8.4	8.5	8.8	8.8	9.1	15.1

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