

Effect of organic and inorganic sources of nutrients on rapeseed (*Brassica campestris L.*) under terai region.

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Rapeseed is one of the most important edible oilseed crops of the Indo-Gangetic plains, however, the production of rapeseed is poor due to erratic management practices and climatic condition. Nutrient management is the key component technology towards the production of rapeseed. A substitution and/or supplementation of major nutrients with a considerable proportion from organic manures or in combination for sustaining of high level of production, is of urgent necessity.

The experiment was conducted at the research farm of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal during the *rabi* season of 2007-08. The farm is situated at 26°19'86" N latitude and 89°23'53" E longitude at an elevation of 43 meters above mean sea level. The area as a whole is humid and warm except having a short winter spell during December to February. The soil is sandy loam, acidic with a pH of 5.42, low in available nitrogen (118 kg ha⁻¹), medium in available phosphorus (24 kg ha⁻¹) and available potash (76 kg ha⁻¹). Twelve treatments viz, T₁:100% RDF (60:30:30 kg ha⁻¹ of N: P: K), T₂:100% RDF + Borax @ 10.0 kg ha⁻¹, T₃:FYM @ 10.0 t.ha⁻¹, T₄:Vermicompost @ 5.0 t.ha⁻¹, T₅:Neemcake @ 5.0 t.ha⁻¹, T₆:Poultry manure @ 5.0 t.ha⁻¹, T₇:T₁+ FYM @ 5.0 t.ha⁻¹, T₈:T₁+ Vermicompost @ 2.5 t.ha⁻¹, T₉:T₁+ Neemcake @ 2.5 t.ha⁻¹, T₁₀:T₁+ Poultry manure @ 2.5 t.ha⁻¹, T₁₁:50% RDF+ FYM @ 2.5 t.ha⁻¹+ VC @1.25 t.ha⁻¹+ NC @ 1.25 t.ha⁻¹+ PM @ 1.25 t.ha⁻¹ and T₁₂:control were laid out in RBD with three replications. Rapeseed cultivar "B-9" was sown with the spacing of 30 x 10 cm. Data were recorded on plant height, leaf area index, crop growth rate, net assimilation rate, number of siliqua plant⁻¹, length of siliqua, number of seeds siliqua⁻¹, test weight and seed yield. The data were analysed statistically for comparing the treatment means.

Plant height

Treatment receiving 50% RDF+ FYM @ 2.5 t.ha⁻¹ + vermicompost @1.25 t.ha⁻¹ + neemcake @ 1.25 t.ha⁻¹ + poultry manure @ 1.25 t.ha⁻¹ recorded the tallest plant (147.18 cm) at harvest which was statistically *at par* with T₉ and T₈, might be due to

greater availability of soil nutrients through out the growth period. Sharma *et al.* (2007) and Kumar and Yadav (2007) also investigated similar trend of result by combination of organics and inorganics sources of nutrients.

Leaf area index (LAI)

Treatment receiving 50% RDF+ FYM @ 2.5 t.ha⁻¹ + vermicompost @1.25 t.ha⁻¹ + neemcake @ 1.25 t.ha⁻¹ + poultry manure @ 1.25 t.ha⁻¹ recorded highest value of LAI (1.88) at 50 days after sowing which was statistically *at par* with T₉, T₈ and T₁₀, might be due to synchronous supply of plant nutrients throughout the growth period.

Crop growth rate (g m⁻² d⁻¹)

Treatment receiving 50% recommended dose+ farmyard manure @ 2.5 t.ha⁻¹ + vermicompost @1.25 t.ha⁻¹ + neemcake @ 1.25 t.ha⁻¹ + poultry manure @ 1.25 t.ha⁻¹ recorded highest value (4.32 g m⁻² d⁻¹) followed T₈, T₁₀ and T₉.

Net assimilation rate (NAR)

At 30-40 days after sowing, T₇ (1.018 g m⁻² d⁻¹) recorded the highest value of net assimilation rate which was followed by T₂ (1.02 g m⁻² d⁻¹) and T₈ (0.93 g m⁻² d⁻¹). At 40-50 days after sowing T₁₁ gave the highest value (1.14 g m⁻² d⁻¹) of NAR which was followed by T₉ (1.13 g m⁻² d⁻¹) and T₈ (1.11 g m⁻² d⁻¹).

Number of siliqua plant⁻¹

Treatments receiving 50% RDF+ FYM @ 2.5 t.ha⁻¹ + vermicompost @1.25 t.ha⁻¹ + neemcake @ 1.25 t.ha⁻¹ + poultry manure @ 1.25 t.ha⁻¹ recorded highest number of siliqua plant⁻¹ (209.66) followed by T₉ (186.66). Sole application of chemical fertilizer recorded lower number of siliqua than the other treatments except T₂ (Table 1). Singh and Singh (2006) opined alike.

Length of siliqua

The length of siliqua was found to be highest (7.20 cm) with T₁₁ (50% recommended dose+ farmyard manure @ 2.5 t.ha⁻¹ + vermicompost @1.25 t.ha⁻¹ + neemcake @ 1.25 t.ha⁻¹ + poultry manure @

Table 1: Effect of organic and inorganic sources of nutrients on growth attributes of rapeseed.

Treatments	Plant height (cm)			Leaf area index			Crop growth rate (g m ⁻² d ⁻¹)				Net assimilation rate (g m ⁻² d ⁻¹)			
	80 DAS	90 DAS	At harvest	30 DAS	40 DAS	50 DAS	30-40 DAS	40-50 DAS	50-60 DAS	60-70 DAS	30-40 DAS	40-50 DAS	50-60 DAS	60-70 DAS
T ₁	128.08	129.02	131.24	0.50	1.06	1.62	1.54	2.22	1.90	0.67	0.90	0.73	0.30	0.07
T ₂	128.91	129.92	131.61	0.51	1.07	1.63	1.77	2.30	2.69	0.45	1.01	0.75	0.43	0.04
T ₃	117.50	120.48	125.27	0.45	0.86	1.27	0.93	1.07	0.18	0.44	0.63	0.44	0.03	0.05
T ₄	127.00	128.65	130.95	0.50	1.01	1.53	1.40	2.35	1.04	0.62	0.84	0.81	0.17	0.06
T ₅	123.50	126.32	130.16	0.47	1.00	1.53	1.18	1.52	0.21	1.33	0.72	0.52	0.03	0.15
T ₆	119.50	122.51	128.33	0.46	0.98	1.51	1.01	1.32	0.27	1.55	0.63	0.46	0.04	0.17
T ₇	129.33	130.03	133.33	0.53	1.08	1.63	1.82	2.24	3.06	0.47	1.01	0.72	0.46	0.04
T ₈	130.00	137.33	140.12	0.56	1.20	1.84	1.81	3.84	4.10	0.54	0.93	1.11	0.58	0.05
T ₉	130.33	139.00	143.39	0.56	1.21	1.86	1.75	3.97	4.05	0.32	0.89	1.13	0.57	0.03
T ₁₀	129.58	131.53	135.55	0.56	1.19	1.82	1.50	3.11	4.09	0.14	0.78	0.90	0.58	0.01
T ₁₁	134.74	141.13	147.18	0.58	1.23	1.88	1.63	4.02	4.32	1.82	0.81	1.14	0.60	0.16
T ₁₂	107.58	116.50	119.51	0.16	0.36	0.56	0.41	0.49	1.13	0.24	0.72	0.48	0.51	0.07
SEm (±)	4.99	3.29	7.20	0.007	0.014	0.03	0.072	0.165	0.307	0.047	0.045	0.60	0.04	0.005
LSD (p=0.05)	10.35	6.84	14.94	0.013	0.029	0.05	0.14	0.34	0.63	0.099	0.094	0.12	0.09	0.01

T₁:100% RDF (60:30:30 Kg/ha⁻¹ of N: P: K),
T₄:Vermicompost @ 5.0 t.ha⁻¹,
T₇:T₁+ FYM @ 5.0 t.ha⁻¹,
T₁₀:T₁+ Poultry manure @ 2.5 t.ha⁻¹,
T₁₂:Control.

T₂:100% RDF + Borax @ 10.0 Kg/ha⁻¹,
T₅:Neemcake @ 5.0 t.ha⁻¹,
T₈:T₁+ Vermicompost @ 2.5 t.ha⁻¹,
T₁₁:50% RDF+ FYM @ 2.5 t.ha⁻¹ + VC @1.25 t.ha⁻¹ + NC @ 1.25 t.ha⁻¹ + PM @ 1.25 t.ha⁻¹,

T₃:FYM @ 10.0 t.ha⁻¹,
T₆:Poultry manure @ 5.0 t.ha⁻¹,
T₉:T₁+ Neemcake @ 2.5 t.ha⁻¹,

Table 2: Effect of organic and inorganic sources of nutrients on yield attributes of rapeseed.

Treatments	Seed yield (q ha ⁻¹)	Siliqua. plant ⁻¹	Length of siliqua (cm)	Number of seeds. siliqua ⁻¹	Test weight (g)
T ₁	4.02	143.33	5.83	17.00	2.55
T ₂	4.98	163.33	6.06	17.66	2.56
T ₃	2.46	115.66	5.26	14.66	2.37
T ₄	3.99	125.66	5.36	16.00	2.53
T ₅	3.97	119.66	4.86	14.00	2.52
T ₆	3.83	116.66	4.86	13.66	2.51
T ₇	5.48	166.33	6.10	18.66	2.60
T ₈	6.03	168.66	6.73	22.00	2.90
T ₉	6.51	186.66	6.80	22.66	2.96
T ₁₀	5.57	167.00	6.76	21.00	2.76
T ₁₁	7.36	209.66	7.20	23.33	3.07
T ₁₂	1.92	90.00	3.46	13.33	2.03
SEm (±)	0.18	7.41	0.33	2.66	0.22
LSD (p=0.05)	0.38	15.37	0.69	5.52	0.46

T₁:100% RDF (60:30:30 Kg/ha⁻¹ of N: P: K),
T₄:Vermicompost @ 5.0 t.ha⁻¹,
T₇:T₁+ FYM @ 5.0 t.ha⁻¹,
T₁₀:T₁+ Poultry manure @ 2.5 t.ha⁻¹,
T₁₂:Control.

T₂:100% RDF + Borax @ 10.0 Kg/ha⁻¹,
T₅:Neemcake @ 5.0 t.ha⁻¹,
T₈:T₁+ Vermicompost @ 2.5 t.ha⁻¹,
T₁₁:50% RDF+ FYM @ 2.5 t.ha⁻¹ + VC @1.25 t.ha⁻¹ + NC @ 1.25 t.ha⁻¹ + PM @ 1.25 t.ha⁻¹,

T₃:FYM @ 10.0 t.ha⁻¹,
T₆:Poultry manure @ 5.0 t.ha⁻¹,
T₉:T₁+ Neemcake @ 2.5 t.ha⁻¹,

1.25 t.ha⁻¹) which was statistically at par with T₉ (T₁+ Neemcake @ 2.5 t.ha⁻¹) followed by T₁₀ (T₁+ Poultry manure @ 2.5 t.ha⁻¹) & T₈ (T₁+ vermicompost @ 2.5 t.ha⁻¹) and lowest in T₁₂ (table 1).

Number of seeds siliqua⁻¹

The Highest number of seeds per siliqua (23.33) was recorded with T₁₁ which was statistically at par with T₉ followed by T₈ and the lowest with T₁₂ (Table 1). Sole application of chemical fertilizer recorded lower number of seeds siliqua⁻¹ These results are in conformity with Singh and Singh (2006).

Test weight

Treatments receiving 50% RDF+ FYM @ 2.5 t.ha⁻¹ + vermicompost @ 1.25 t.ha⁻¹ + neemcake @ 1.25 t.ha⁻¹ + poultry manure @ 1.25 t.ha⁻¹ recorded the highest test weight value (3.07 gm) followed by T₁₀ and T₈ and the lowest was in T₁₂ (Table 1).

Seed yield

Seed yield was recorded to be highest (7.36 q ha⁻¹) under T₁₁ (50% RDF + FYM @ 2.5 t.ha⁻¹ + vermicompost @ 1.25 t.ha⁻¹ + neemcake @ 1.25 t.ha⁻¹ + poultry manure @ 1.25 t.ha⁻¹) which was statistically at par with T₉ (6.51 q ha⁻¹) followed by T₈ (6.03 q ha⁻¹) and T₁₀ (5.57 q ha⁻¹) and lowest was recorded in T₁₂ (1.92 q ha⁻¹). This might be due to higher number of seeds siliqua⁻¹ and higher test weight (Table 2). These results confirm the findings of Abrol *et al.* (2007).

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