



ISSN Print: 2618-060X
 ISSN Online: 2618-0618
 NAAS Rating (2026): 5.20
 IJRA 2026; 9(10): 363-367
www.agronomyjournals.com
 Received: 25-08-2026
 Accepted: 26-09-2026
 Published: 07-10-2026

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Effect of FYM and sulphur levels on nutrient uptake, yield of component crops and economics of chickpea + mustard intercropping system

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DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i10e.6810>

ABSTRACT

A field experiment was conducted at C.S. Azad University of Agriculture & Technology, Kanpur during Rabi seasons of 2009-10 and 2010-11. Treatments included three cropping system viz. Sole chickpea, sole mustard and chickpea + mustard (4:1) which were tested 3 levels each of FYM (0, 5 and 10 t/ha) and sulphur (0, 30 and 60 kg/ha). Pooled result showed that sole chickpea produced significantly higher grain yield (19.38 q/ha), straw yield (33.24 q/ha), N,P,K and S uptake than intercropped chickpea. Application of FYM @ 10 t/ha gave significantly higher grain yield (20.69 q/ha), straw yield, N,P, K and K-uptake. Sulphur application @ 60 kg/ha produced statistically higher grain yield, straw yield, nutrient uptake (N,P,K,S) but statistically equal to 30 kg S/ha. Sole mustard registered significant maximum seed. Yield (20.31 q/ha), stover yield and nutrient content (NPKS) than intercropped mustard. Application of 10 t/ha FYM produced statistically highest seed yield, stover yield and nutrient uptake. Significantly highest seed yield, Stover yield and nutrient uptake (NPKS) were found with the use of 60 kg/ha. Among cropping system the highest gross income (Rs. 61183/ha), net income (Rs. 35464/ha) and benefit: cost ratio (2.36) was recorded in chickpea + mustard (4:1) system. Among FYM levels, @ 10 t/ha earned maximum gross income (Rs. 66132/ha), net profit (Rs. 42040/ha) and benefit. Cost ratio (2.41). Application of sulphur @ 60 kg/ha gave maximum gross return of Rs. 59825/ha, net profit (Rs. 32608/ha) but B:C ratio was highest (2.21) at 30 kg S/ha.

Keywords: Intercropping, Grain yield, Nutrient uptake, FYM

Introduction

Pulses and oil seeds both are the important groups of field crops grown in India. Pulses provide protein while oilseeds provide fat for human consumption. Besides pulses are also known to reform soil fertility by fixation of atmospheric nitrogen through root nodules, deep tap root system and major leaf fall whereas oil seeds play an important role in Indian industries trade. In the Central and Northern region of India, the most commonly grown winter pulse and oil seed crops are chickpea and mustard. Inter cropping utilizes the inter-spaced of widely space crops like mustard and chickpea. Chickpea cultivation with mustard crop augments the production and profitability. In intercropping of chickpea + Mustard. Suitable row ratio, suitability of varieties, date of sowing and nutrient management of both the component crops are essential aspects. FYM have been traditionally used in agriculture for maintaining soil fertility and due to nutrient content, higher organic matter, increased water solving by capacity and increased uptake of nutrients and yield stability. Sulphur play direct role in fatty acid synthesis. It is a constituent of amino acids Cysteine and methionene. It is also required for synthesis of chlorophyll and vitamins like biotin and thiamine. Thus in present investigation different levels of FYM and sulphur were under taken in chickpea + mustard intercropping.

Materials and Methods

The present experiment was conducted at C.S. Azad University of Agriculture & Technology, Kanpur during Rabi season of 2009-10 and 2010-11. The soil of the experimental field was sandy loam in texture having slightly alkaline (pH 7.4) in reaction. It contained 0.40% organic carbon, 169 kg/ha available N, 16.2 kg/ha available P₂O₅, 180 kg/ha available K₂O and 18.2 kg/ha available sulphur. The treatment included 3 cropping system viz. sole chickpea, sole mustard, chickpea + mustard (4:1) which were tested with three levels each of FYM (0, 5 and 10 t/ha) and sulphur (0,30 and 60 kg/ha). Thus 27 treatments were tested in a three replicated split plot design in which cropping system and FYM doses were kept in main plot and sulphur doses in subplots. Chickpea variety KPG-59 and mustard variety Vardan were used. A uniform application of 20 kg N + 40 kg P₂O₅ + 30 kg K₂O/ha in chickpea and 120 kg N + 60 kg P₂O₅ + 40 kg K₂O/ha in mustard was done in all treatment plots. In inter cropping plots; fertilizers were applied row wise on the basis of actual area sown under each component crop. FYM and sulphur doses were applied as per treatment. Chickpea

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and mustard crops was shown on Nov. 25, 2009 and Nov. 15, 2010 and seed rate used @ 80 kg/ha (chickpea) and 6 kg/ha (mustard) in sole and in intercropping on row basis. Seeds of gram and mustard were sown behind country plough keeping furrow distance 40 cm later on 20 cm plant distance was maintained by thinning in mustard crop after 20-25 DAS. Crop was irrigated twice i.e. 30-01-2010 and 10-03-2010 in first year and 20-1-2011 and 20-03-2011 in second year. The mustard crop was harvested on 01-04-2010 and 30-03-2011 while chickpea on 15-04-2010 and 14-04-2011 during both years, respectively. The N.P.K and S content in seed and straw of chickpea and mustard were estimated by standard procedure and later on calculated with the multiplication of their yields. The grain/seed and straw/stover yield of chickpea and mustard were recorded and cost of cultivation, gross income, net profit and B:C ratio were estimated on the basis of prevailing market rates of both the component crops and sum was used in intercropping system. Two years data were pooled and pooled value have been presented here under.

Result and Discussion

Effect of nutrient uptake by chickpea crop

It is evident from table-1 that N-uptake in grain and straw were worked out significantly higher in sole chickpea than inter cropping chickpea. N-uptake in intercropped chickpea reduced by 23.1% in grain and 24.5% in straw compared to sole chickpea. Increasing levels of FYM and sulphur application increased N-uptake in grain and straw upto 10 t/ha FYM and 60 kg S/ha but margin of increase due to sulphur beyond 30 kg S/ha was not found significant in case of N-uptake in straw.

P-uptake in grain and straw of chickpea was recorded significantly higher in sole chickpea which reduced in intercropped chickpea by the margin of 23.8% in grain and 27.3% in straw. Application of FYM and sulphur increased p-uptake upto their highest level of 10 t/ha FYM and 60 kg S/ha.

K-uptake in grain and straw were worked out significantly higher in sole chickpea which reduced in intercropped chickpea by 24.2% in grain and 24.1% in straw. Application of FYM and sulphur increased K-uptake significantly upto 10 t/ha FYM and 60 kg S/ha but K-uptake in straw could not show significantly increase beyond 60 kg S/ha.

S-uptake in grain and straw was significantly higher in sole chickpea which reduced intercropped chickpea by 27.9% in grain and 29.9% in straw. In general S-uptake was found remarkable higher in grain and straw. Application of FYM and sulphur increased S-uptake in grain and straw upto their highest level of 10 t/ha FYM and 60 kg S/ha.

The N, P, K and S-uptake was more in sole chickpea due to higher absorption of nutrients and their translocation from source to sink because of favorable growth condition. It might be attributed mainly grain and straw yields and partly due to concentration of nutrients in grain and straw. The results are in accordance to those of Singh *et al.* (1997), Parihare *et al.* (2000) [1] and Tripathi *et al.* (2005) [2]. FYM increased the microbial activity in soil and thus availability of nutrients for plants properly and translocation from source to sink. Sulphur also improves absorption of other nutrients in plants. Higher level of FYM and sulphur application might be attributed to combined effect of grain and straw yields and NPKS concentration in grain and straw. Similar results were observed by Singh *et al.* (2004), Kumar *et al.* (2006) and Tanware *et al.* (2010) [3].

Effect on grain and straw and yield of chickpea

The data provided in table-1 revealed that sole chickpea produced significantly higher grain yield of 19.38 q/ha as against 15 q/ha of inter cropped chickpea. Grain yield increased significantly upto 10 t/ha FYM (20.69 q/ha). S-application @ 30 and 60 kg/ha increased grain yield over no sulphur by a margins of 1.43 and 2.14 q/ha, respectively.

Sole chickpea recorded significantly higher straw yield which reduced in inter cropped chickpea by 7.54 q/ha. Increasing levels of

FYM increased straw yield significantly upto 10 t/ha FYM. Sulphur application increased straw yield upto 60 kg/ha but increased beyond 30 kg S/ha was not found significant. Grain and straw yield were produced higher in sole chickpea. It might be attributed to higher plant population and no competition for light, space, nutrients and moisture. These results corroborate with the findings of Prasad *et al.* (2006) [4], Prasad *et al.* (2003) [5], Tripathi *et al.* (2005) [2], Kour *et al.* (2014) [6]. Grain and straw yield increased upto 10 t/ha FYM. It might be attributed to better growth and yield attributes. FYM enhanced soil health. These results are inconsonance with those of Kumar and Yadav (2003) and Tanware *et al.* (2010) [3]. Sulphur increased grain and straw yield may be due to sulphur plays a vital role in vegetative structure for nutrient absorption and provide strong sink strength as well production to assimilate. The results in accordance with these reported by Kumar *et al.* (2006).

Effect of nutrient uptake by mustard crop

It is clear from table-2 that sole mustard taken upto significantly higher amount of nitrogen in seed and stover which reduced in intercropped mustard by a margin of 48.36 kg/ha in seed and 16.82 kg/ha in stover. Increasing levels of FYM or sulphur increased N-uptake significantly in seed and stover up to 10 t/ha FYM and 60 kg S/ha.

Sole mustard recorded much P-uptake which significantly reduced in intercropped mustard by the margin of 9.11 kg/ha in seed and 2.21 kg/ha in stover. Increasing levels of FYM application increased P-uptake in seed with upto 10 t/ha FYM and stover upto 5 t/ha. Sulphur application @ 60 kg/ha could increase P-uptake in seed over no sulphur.

Sole mustard recorded significantly higher K-uptake which reduced in intercropped mustard by 10.17 kg/ha in seed and 25.17 kg/ha in stover. Increasing levels of FYM upto 10 t/ha and sulphur upto 60 kg/ha in both seed and stover.

Pure mustard had higher uptake in seed and stover which reduced significantly in intercropped mustard by 8.34 kg/ha in seed and 7.49 kg/ha in stover. Increasing levels of FYM increased S-uptake significantly upto highest level of 10 t/ha FYM but sulphur application increased S-uptake significantly only with upto 30 kg S/ha.

Increased NPK and S-uptake seems to be due to the fact that uptake of nutrients is a product of biomass accumulation by particular part and its nutrient content. Thus sole mustard had more NPKS uptake. Similarly positive effect of FYM application both these aspects ultimately led to higher accumulation of nutrients (Kumawat *et al.*, 2014) [7]. These results are in accordance with the findings of Chaurasia *et al.* (2009) [8] and Singh *et al.* (2011) [9]. Increase of nutrient uptake due to sulphur application might be attributed to balanced fertilization as recommended doses of NPK have been applied uniformly. S-improved nutritional environment in rhizosphere. These results confirm the findings of, Talware *et al.* (2013) and Singh *et al.* (2013) [10].

Effect on seed and stover yield of mustard

The result (Table-1) revealed that sole mustard produced significantly higher seed yield which reduced in intercropped mustard by the margin of 13.35 q/ha or 65.7%. Application of 5 and 10 t/ha FYM increased seed yield over no. FYM by 2.24 and 3.56 q/ha, respectively. Sulphur application also increased seed yield upto highest level of 60 kg S/ha which was found significant only yield without sulphur. Stover yield reduced significantly intercropped mustard by 19.52 q/ha or 71.1%. FYM application increased stover yield significantly upto 5 t/ha FYM while sulphur had no significant effect on straw yield and mustard. 5 and 10 t/ha FYM increased stover yield by 1.34 and 1.88 q/ha over no FYM.

The reduction in intercropped mustard was due to lower plant population of mustard. The result was supported by the findings of Prasad *et al.* (2006) [4] and Tripathi *et al.* (2005) [2]. FYM enhanced seed and stover yield due to improvement in soil health and sulphur to may be positive effect of source to sink strength. The results are in accordance with the results reported by Prasad *et al.* (2006) [4], Tripathi *et al.* (2005) [2] and Singh *et al.* (2019) [11].

Effect on economic parameters of chickpea + mustard system

It is apparent from table-3 that among intercropping system registered highest values of Rs. 61183/ha gross return, Rs. 35464/ha net profit and 2.36 B: C ratio. In case of FYM levels 10 t/ha resulted the highest values of Rs. 66133/ha gross income, Rs. 42040/ha net profit and 2.42 B:C ratio. Sulphur application @ 60 kg/ha earned highest values of gross income (Rs. 59825/ha) and net profit (Rs. 32608/ha). B:C ratio was not influenced significantly by sulphur application. It might be attributed to higher chickpea equivalent yield (gross income). These results corroborated with the findings of Tripathi *et al.* (2005) [2], Prasad *et al.* (2006) [4], Yadav *et al.* (2013) [12] and Kour *et al.* (2014) [6]. Margin of increases much lesser in cultivation cost than gross income. It might be due to increase in crop yield because of FYM or sulphur was much higher than cost in valued. Therefore net profit and B:C ratio increased with increasing FYM and Sulphur. Tanwar *et al.* (2010) [3], Kunware *et al.* (2014) [6] and Singh *et al.* (2011) [9] supported these findings.

Conclusion

The field experiment at C.S. Azad University of Agriculture & Technology, Kanpur, during the Rabi seasons of 2009-10 and 2010-11, provides valuable insights into crop yield optimization. Sole chickpea cultivation outperformed the chickpea-mustard intercrop in grain and straw yield, along with N, P, K, and S uptake. The application of 10 tons per hectare of FYM notably enhanced these yields and nutrient uptakes. Similarly, sulphur application at 60 kg/ha improved yields and nutrient uptake, with comparable results at 30 kg/ha. In contrast, sole mustard cultivation resulted in the highest seed and stover yields and nutrient content, which were further elevated by applying 10 t/ha FYM and 60 kg/ha sulphur. Economically, the chickpea-mustard cropping system (4:1) achieved the highest gross income, net income, and benefit-cost ratio. These results underscore the significance of optimal FYM and sulphur application in enhancing crop yield and profitability, with the integrated chickpea-mustard system showing particular promise for maximizing economic returns.

Table 1. Effect of treatments on grain and straw yield, uptake of N,P, K and S by chickpea crop (Pooled data of 2 years)

Treatments	Grain yield (q/ha)	Straw yield (q/ha)	N-uptake by grain (kg/ha)	N-uptake by straw (kg/ha)	P-uptake by grain (Kg/ha)	P-uptake by straw (kg/ha)	K-uptake by grain (kg/ha)	K-uptake by straw (kg/ha)	S-uptake by grain (kg/ha)	S-uptake by straw (kg/ha)
Cropping System										
Sole chickpea	19.38	33.24	57.87	42.68	6.43	6.85	21.74	52.84	12.40	9.69
Chickpea + Mustard (4:1)	15.00	25.70	45.42	32.22	4.90	4.98	16.48	40.12	8.94	6.79
S.Ed. ±	0.27	0.36	0.55	0.38	0.12	0.12	0.33	0.50	0.15	0.15
CD (P = 0.05)	0.57	0.76	1.15	0.80	0.24	0.24	0.68	1.04	0.31	0.32
FYM levels (t/ha)										
0	13.56	26.89	37.20	32.61	4.21	4.60	14.18	40.37	7.19	6.73
5	17.32	29.42	51.09	37.16	5.62	5.83	19.38	46.33	10.74	8.03
10	20.69	32.11	65.31	42.59	7.18	7.30	23.78	52.74	14.07	9.97
S.Ed. ±	0.27	0.44	0.93	0.47	0.14	0.19	0.40	0.84	0.15	0.18
CD (P = 0.05)	0.57	0.93	1.86	0.98	0.30	0.39	0.83	1.68	0.31	0.37
Sulphur levels (kg/ha)										
0	16.00	28.59	46.90	35.70	5.23	5.45	17.59	44.12	9.47	7.63
30	17.43	29.61	51.70	37.76	5.73	5.89	19.36	46.93	10.86	8.29
60	18.14	30.22	54.99	38.90	6.03	6.40	20.37	48.39	11.66	8.80
S.Ed. ±	0.76	0.61	1.33	0.88	0.30	0.28	0.39	1.19	0.25	0.25
CD (P = 0.05)	1.51	1.21	2.63	1.75	0.59	0.55	0.79	2.36	0.50	0.50

Table 2. Effect of treatments on seed and straw yield, uptake of N, P, K and S by mustard crop (Pooled data of 2 years)

Treatments	Seed yield (q/ha)	Stover yield (q/ha)	N-uptake by seed (kg/ha)	N-uptake by stover (kg/ha)	P-uptake by seed (Kg/ha)	P-uptake by Stover (kg/ha)	K-uptake by seed (kg/ha)	K-uptake by Stover (kg/ha)	S-uptake by seed (kg/ha)	S-uptake by Stover (kg/ha)
Cropping System										
Sole mustard	20.31	27.45	74.08	23.41	13.93	3.09	15.51	35.11	12.73	10.31
Chickpea + Mustard (4:1)	6.96	7.93	25.72	6.59	4.82	0.88	5.34	9.94	4.39	2.82
S.Ed. ±	0.35	0.25	0.67	0.16	0.16	0.05	0.13	0.17	0.13	0.17
CD (P = 0.05)	0.77	0.53	1.40	0.34	0.33	0.11	0.27	0.36	0.27	0.36
FYM levels (t/ha)										
0	11.69	16.63	41.13	12.94	7.49	1.76	8.86	19.50	7.20	5.79
5	13.93	17.97	50.98	15.45	9.63	2.04	10.63	23.16	8.77	6.67
10	15.25	18.51	57.58	16.63	10.99	2.15	11.80	24.92	9.71	7.22
S.Ed. ±	0.42	0.31	0.82	0.27	0.27	0.11	0.22	0.21	0.20	0.14
CD (P = 0.05)	0.88	0.64	1.71	0.57	0.57	0.21	0.44	0.43	0.40	0.29

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Treatments	Seed yield (q/ha)	Stover yield (q/ha)	N-uptake by seed (kg/ha)	N-uptake by stover (kg/ha)	P-uptake by seed (kg/ha)	P-uptake by Stover (kg/ha)	K-uptake by seed (kg/ha)	K-uptake by Stover (kg/ha)	S-uptake by seed (kg/ha)	S-uptake by Stover (kg/ha)
Sulphur levels (kg/ha)										
0	12.93	17.38	46.77	14.43	8.74	1.93	9.85	21.75	8.09	6.30
30	13.61	17.67	49.25	14.99	9.35	2.00	10.39	22.49	8.54	6.57
60	14.37	18.06	53.10	15.60	10.03	2.02	11.03	23.33	9.04	6.83
S.Ed. $\pm$	0.53	0.55	1.65	0.38	0.39	0.11	0.22	0.46	0.29	0.14
CD ($P = 0.05$)	1.05	N.S.	3.63	0.76	0.76	N.S.	0.44	0.90	0.57	0.27

Table 3. Effect of treatments on economic parameters of chickpea + mustard intercropping system (pooled data of 2 years).

Treatments	Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	Benefit: Cost Ratio
Cropping System				
Sole chickpea	25857	55598	29740	2.13
Sole mustard	25200	53504	28303	2.11
Chickpea + Mustard (4:1)	25725	61183	35464	2.36
S.Ed. $\pm$	-	191	173	0.02
CD ($P = 0.05$)	-	389	353	0.05
FYM levels (t/ha)				
0	23755	46640	24090	1.96
5	25736	57513	34106	2.23
10	27293	66132	42040	2.42
S.Ed. $\pm$	-	191	173	0.02
CD ($P = 0.05$)	-	389	353	0.05
Sulphur levels (kg/ha)				
0	23895	53282	29387	2.21
30	25666	57178	31513	2.21
60	27223	59825	32608	2.19
S.Ed. $\pm$	-	261	232	0.03
CD ($P = 0.05$)	-	518	459	N.S.

References

- Parihar SS, Pandey D, Verma VK, Shukla RK, Chaure NK, Chaudhary KK, Pandey KS. Effect of spatial arrangement of intercropping and irrigation level on economics and nutrient uptake of chickpea (*Cicer arietinum* L.) and mustard (*Brassica Juncea* L.). International Journal of Tropical Agriculture. 2000;18(3):244-246.
- Tripathi HN, Subhash Chand, Tripathi AK. Biological and economical feasibility of chickpea (*Cicer arietinum* L.) + Indian mustard (*Brassica Juncea* L.) cropping system under varying levels of phosphorus. Indian Journal of Agronomy. 2005;50(1):31-34.
- Tanwar SPS, Rakodia P, Singh AK. Productivity, nutrient balance and economics of Kabali chickpea (*CicerKabulium* L.) as influenced by integrated nutrient management. Indian Journal of Agronomy. 2010;55(1):51-55.
- Prasad K, Singh RK, Ram Pyare. Studies on the intercropping of mustard varieties with chickpea. Indian Journal of Pulses Research. 2006;19(1):73-75.
- Prasad Kedar, Rawat SK, Pyare Ram. Performance of mustard varieties with association of chickpea under limited irrigations. Farm Science Journal. 2003;12(2):157-158.
- Kaur R, Sharma BC, Kunwar A, Nandan B, Kour P. Effect of weed management on chickpea (*Cicer arietinum* L.) + Indian mustard (*Brassica Juncea* L.) intercropping under irrigated conditions of Jammu region. Indian Journal of Agronomy. 2014;59(2):242-246.
- Kumawat A, Pareek BL, Yadav RS, Rathore PS. Effect of integrated nutrient management on growth, yield quality and nutrient uptake of Indian mustard (*Brassica juncea* L.) in arid zone of Rajasthan Indian Journal of Agronomy. 2014;59(1):119-123.
- Chaurasia A, Singh SB, Namdee KN. Integrated nutrient management in relation to yield and yield attributes and oil yield of Ethiopian mustard (*Brassica carinata* L.) Crop Research. 2009;38(1/3):24-28.
- Singh SP, Pal Mahesh. Effect of integrated nutrient management on productivity, quality, nutrient uptake and economics of mustard (*Brassica Juncea* L.). Indian Journal of Agronomy. 2011;56(4):381-387.
- Singh P, Panotra N, Singh KN, Kanht RH. Interaction effect of sulphur and potassium on nutritional quality and profitability of brown sorson (*Brassica rapa* var. brown sarson) in temperate Kashmir. Indian Journal of Agronomy. 2013;58(1):91-95.
- Singh Vipul, Ghanshyam Singh, Vinay Kumar Pandey, Manoj Kumar, Ajay Singh. Performance of chickpea-mustard intercropping on yield and economics of chickpea and mustard crop under different fertility management and various raw combinations. International Journal of current microbiology and applied sciences. 2019;8(1):236-249.
- Yadav PK, Vishram Ram, Singh DAP, Ram Ruchi. Effect of row ratio and phosphorus fertilizer in chickpea (*Cicer arietinum* L.) and mustard (*Brassica Juncea* L.) intercropping system. Indian Journal of Agronomy. 2013;58(2):198-200.

13. Kumar A, Prasad S, Kumar KB. Effect of boron and sulphur on performance of gram *Cicer arietinum* L.). Indian Journal of Agronomy. 2008;51(1):57-59.

How to cite this article: Lal C, Singh V, Pyare R, Pal M, Singh GK, Bhayankar, et al. Effect of FYM and sulphur levels on nutrient uptake, yield of component crops and economics of chickpea + mustard intercropping system. *International Journal of Research in Agronomy*. 2026;9(10):363-367. doi: <https://www.doi.org/10.33545/2618060X.2026.v9.i10e.6810>

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