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Yield and quality of mustard as affected by organic weed and nutrient management practices

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ABSTRACT

Growth and yield parameters, crop yields as well as oil and nutrient content were analyzed for Indian mustard (Brassica juncea Czern L.) grown in field trials as residual crop at College of Agriculture Sumerpur in Western Rajasthan of India during winter season of 2019 and 2020 using six treatments of weed management and five treatments of integrated organic nutrient management in split plot design. The application of organic mulch and application of farm yard manure (FYM) significantly affected the bio mass yield as well as quality parameters of crop. The results reveal the significant differences in growth and yield attributes, yields and oil content in mustard seed. However, weed management practices found to be non-significant in recording these parameters except oil content. The results further shows that the vermicompost and weed free check did not reflect significant differences in parameters under study.

Keywords: Growth attributes, Mustard, Oil content, Organic management, Yield.

India as a country and Rajasthan among the states are the major rapeseed-mustard acreage holder and occupys the leading position in acreage of 6.78 M ha and 2.95 M ha, respectively during 2019-20. This group of crops is largely grown under residual moisture conditions with poor management resulted in poor productivity (1345 kg ha^{-1})(Agricultural statistics at a glance, 2020). Maize is grown as main crop in irrigated belts followed by Indian mustard as residual crop in water scarcity areas of Rajasthan which is well known remunerative cropping system. The state is leading in production of Indian mustard during winter season as gave higher economic returns with least inputs.Crop residue of annual crops after removing economic parts, is an underutilized source of great quantity (Li *et al*. 2000) because majority of farmers used them for animal feeding. They contain high amount of lignin, cellulose, crude protein, mineral elements such as phosphorus (P), potassium (K) and trace elements. Using straw as fodder for ruminant animals could solve the problems of fodder shortage and bring positive economic, ecological and social impacts but Indian farmers burn sometime which it causes great pollution problems. Their use as organic mulch in wide spaced cereal crop and incorporation in field after harvest of main crop proved significance in refining soil physical and biological properties and ultimately reflected in higher yields. Similarly, application of well decomposed FYM causing a significant residual effect on succeeding crop is well known (Kumpawat, 2010). Hence, uses of these farm wastes after decomposition may solve the problem of climate change and global warming indirectly.

The benefits of weed management other than herbicides and nutrient management through organic manure are following to maintain soil quality which have been increasingly recognized (Shukla *et al*., 2011) instead of herbicides and fertilizers those imbalance the ecosystem and caused multiple-nutrient deficiencies, adversely affected the soil as well as aerial environment (Karunakaran and Behera, 2013).The incorporation of crop residue used as mulch after harvest of crop improved soil physical and chemical properties improved the parameters under study by favouring mineralization as reported by Pawar *et al.,* (2013). Similarly, the maximum research works indicated that soils enriched with higher microbial diversity by adopting organic nutrition against chemical based farming systems were well established (Shannon *et al.,* 2002). Since information on residual impact of various weed and nutrient management practices on succeeding mustard is rare, the present research experiment was undertaken to study their effect on growth, crop yields and quality of mustard in western Rajasthan.

MATERIALS AND METHODS

An experiments were conducted during winter season 2019-20 to 2020-21 at instructional farm of College of Agriculture Sumerpur, Agriculture University Jodhpur (Rajasthan-India) situated inTransitional Plain Zone of Luni Basins i.e., Zone II B of Rajasthan. The soil of the experimental site was sandy loam in texture,

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having alkaline pH (7.8), low in organic carbon and nitrogen (0.26% and 198.7 kg ha^{-1}, respectively), medium in phosphorus (26.6 kg ha^{-1}) and high in potassium (260.0 kg ha^{-1}).The research experiment consist of six organic weed management and five organic nutrient management sources in split plot design and in three replications. The mustard variety i.e. DRMRIJ 31 was sown at recommended spacing of 30 x 10 cm using same layout as for maize during summer season. The uniform dose of 40 kg N equivalent through FYM was incorporated 20 days advance to date of sowing. The crop was irrigated as per need. The details of experimental units are as follows

Weed management treatments:

W_1-Stale seedbed (SS) + two hoeing at 20 and 40 DAS,

W_2-SS + hoeing with power weeder at 20 DAS + hoeing once manually at 40 DAS,

W_3-SS +hoeing once manually at 20 DAS + straw mulch (5 t ha^{-1}) at 30 DAS,

W_4-SS + black plastic mulch at sowing (25 micron),

W_5-Weed free check and

W_6-Weedy check

Nutrient management treatments:

N_1-100% RDN through FYM,

N_2-75% RDN through FYM + organic concoction*,

N_3-100% RDN through vermicompost,

N_4-75% RDN through vermicompost as basal + organic concoction and

N_5-75 % RDN through vermicompost in two splits i.e. 75% as basal + 25% as top dressing at 30 DAS + organic concoction

*Seed treatment with *beejamrut* + spray of *jeevamrut* @ 500 Lha^{-1}twice at sowing and 30 DAS.

The growth and yield attributes were recorded on the basis of five plant observation randomly selected from every experimental unit at harvest and averaged. The grain and straw yield of mustard were calculated plot basis and was converted in $kgha^{-1}$ as per standard protocols. The oil percentage in seed from each net plot sample was determined by Nuclear Magnetic Resonance (NMR) method.

RESULTS AND DISCUSSION

Growth and yield attributes

The pooled data revealed that the weed management treatments were failed to exert a significant residual effect on various growth parameters under study. However, the incorporation of organic matter in soil after harvest of main crop of mulched material was found superior as compared to rest of the treatments and recorded higher values of parameters under study. The residual effect of weed management treatments failed to influence the growth and yield performance of crop significantly but add sufficient amount of organic matter through organic mulch resulting in improved physical and biological properties of soil and improved the growth of mustard plant (Gupta, 2018).

Among the organic nutrient management, 100% RDN through FYM significantly improved the plant height and plant dry matter accumulation at 30 DAS, the siliqua per plant and number of seeds per siliqua and 1000 seed weight among various yield attributes (Table 1). This treatment was found at par with 75% RDN through FYM + organic concoction and 75% RDN through vermicompost in two splits + organic concoction for growth and yield parameters as against the minimum in 100% RDN through vermicompost. Among the treatments, the maximum mean plant dry matter of 2.02 $gplant^{-1}$and plant height of 22.64 cm was recorded in treatment 100% RDN through FYM and were 3.6 and 7.2 percent, respectively superior in comparison to 75% RDN through vermicompost as basal+ organic concoction. The similar trend was recorded in various yield attributes like maximum number of siliqua per plant and number of seeds per siliqua of 121.0 and 13.7, respectively were recorded in 100% RDN through FYM followed by 75% RDN through FYM as basal + organic concoction and minimum in 75% RDN through vermicompost as basal + organic concoction (114.6 and 13.1, respectively). While the 1000 seed weight was remain unaffected.

Seed and straw yields

The significant increase in yield of mustard i.e. 2,174 and 2,111 kg $ha^{-1}$was recorded in 100% RDN through FYM followed by 75% RDN through FYM as basal+ organic concoction, respectively as against lowest in 100% RDN through vermicompost(1,986 kg ha^{-1}) and 75% RDN through vermicompost+organic concoction (1,988 kg ha^{-1}). Similar trend was recorded in straw yields during both years of experimentation while harvest index remain unaffected.Increase in growth and yield parameters and yield under 100% RDN through FYM might be owing to regular supply of nutrients retained by soil due to slow mineralization and more conducive soil root environment for higher uptake of nutrients and water and in turn, boosted the overall growth and yield. This in turn increased nutrient uptake and stimulated growth of the plant (Choudhary *et al*., 2016).The adequate soil moisture increases the absorption of major nutrients (NPK), favour in a rapid expansion of foliage, better accumulation of photosynthates in sink which eventually led to an increase in the seed and straw yield of mustard. These findings are in line of results reported by Kumpawat (2010) and Singh *et al.* (2011).

Table 1: Effect of organic crop management practices on growth and yield parameters of mustard (Pooled of two years)

Treatments	Dry matter accumulation (g plant^{-1}) at 30 DAS	Plant height (cm) at 30 DAS	Siliqua plant^{-1}	Seeds siliqua^{-1}	1000-seed weight (g)	Seed yield (Kg ha^{-1})	Straw yield (Kg ha^{-1})	Harvest Index (%)
Weed management								
SS+ HT at 20 and 40 DAS	2.00	21.34	114.43	13.30	5.66	2087	5720	26.79
SS+ H with power weeder at 20 DAS + HO at 40 DAS	1.98	21.66	113.17	12.89	5.60	2028	5661	26.35
SS+ Hoeing once at 20 DAS + Straw mulch at 30 DAS	1.95	21.49	117.51	13.50	5.77	2110	5703	26.99
SS+ Plastic mulch at sowing	2.01	22.01	113.77	13.43	5.77	2008	5712	26.01
Weed free check	1.95	21.36	122.50	13.50	5.75	2082	5702	26.75
Weedy check	2.00	21.38	114.32	12.49	5.58	2061	5531	27.17
SEm(±)	**0.04**	**0.40**	**2.29**	**0.31**	**0.06**	**37**	**106**	**0.43**
LSD (0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Nutrient management								
100% RDN FYM	2.02	22.64	121.04	13.74	5.79	2174	5858	27.06
75% RDN FYM + Organic Concoction	2.00	21.90	118.17	13.29	5.68	2111	5719	26.99
100% RDN VC	1.98	20.78	111.04	12.56	5.66	1986	5438	26.75
75% RDN VC + Organic Concoction	1.96	21.12	114.56	13.12	5.67	1988	5632	26.08
75% RDN VC (2 splits) + Organic Concoction	1.95	21.26	114.94	13.23	5.65	2055	5711	26.49
SEm(±)	**0.02**	**0.28**	**1.83**	**0.16**	**0.05**	**25**	**51**	**0.31**
LSD (0.05)	**0.05**	**0.80**	**5.14**	**0.44**	**NS**	**70**	**143**	**NS**

Table 2: Effect of organic crop management practices on nutrient content in mustard (%) (Pooled of two years)

Treatments	Nitrogen		Phosphorus		Potassium		Oil content
	Seed	Straw	Seed	Straw	Seed	Straw	Seed
Weed management							
SS+ HT at 20 and 40 DAS	3.105	0.875	0.572	0.257	0.790	1.075	41.75
SS+ H with power weeder at 20 DAS + HO at 40 DAS	3.076	0.872	0.568	0.258	0.781	1.080	41.62
SS+ Hoeing once at 20 DAS + Straw mulch at 30 DAS	3.069	0.875	0.576	0.258	0.789	1.105	42.02
SS+ Plastic mulch at sowing	3.103	0.879	0.571	0.258	0.790	1.088	41.96
Weed free check	3.104	0.875	0.575	0.259	0.787	1.092	41.98
Weedy check	3.050	0.864	0.565	0.253	0.770	1.075	41.35
SEm(±)	**0.020**	**0.007**	**0.005**	**0.003**	**0.006**	**0.009**	**0.17**
LSD (0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.50**
Nutrient management							
100% RDN FYM	3.120	0.884	0.579	0.261	0.788	1.099	41.78
75% RDN FYM + Organic Concoction	3.061	0.871	0.567	0.257	0.778	1.085	41.75
100% RDN VC	3.086	0.882	0.574	0.256	0.795	1.088	41.77
75% RDN VC + Organic Concoction	3.080	0.867	0.567	0.255	0.778	1.077	41.80
75% RDN VC (2 splits) + Organic Concoction	3.076	0.863	0.569	0.256	0.781	1.081	41.80
SEm(±)	**0.017**	**0.006**	**0.004**	**0.002**	**0.005**	**0.006**	**0.11**
LSD (0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Quality parameters

The various weed management practices did not affect the nitrogen, phosphorus and potassium content in seed and straw, however significantly affected the oil content in seed both during *rabi* 2019-20, 2020-21 as well as in pooled study (Table 2). The maximum oil content in mustard seed of 42.02 per cent was recorded in treatment stale seed bed + hoeing once at 20 DAS+ straw mulch at 30 DAS as against minimum in weedy check (41.35%).However, oil content was ranged from 41.75 to 41.80 per cent in pooled analysis. Residual effect of FYM had pronounced beneficial effect on the utilization and more uptake of nitrogen, phosphorus and potassium by residual mustard crop because of favourable effect of FYM on N absorption coupled with greater yield (Kumar and Singh, 2019), higher native phosphorus solubilization (Chandan *et al.* 2018) and higher content of K in stover (Singh, 2020). Similar, mechanism was also reported with incorporation of straw mulch in soil (Gupta *et al*., 2014) in maize-gobhi sarson system.

CONCLUSION

Application of 75 % N equivalent through FYM + organic concoction in maize has pronounced effect on productivity of mustard in succeeding season by significantly affecting various growth and yield attributes in study. While organic methods of weed control has no residual effect in mustard for weed control as well as productivity point of view under organic farming.

REFERENCES

Agricultural Statistics at a Glance, 2020.Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi.www.dacnet.nic.in

Chandan, S.K., Singh, S.K., Pandey, A., Singh, P. and Prabha, S. 2018. Effect of integrated nutrient management on growth, yield and nutrient uptake by Indian mustard (*Brassica juncea* L). *Ann. Plant Soil Res.,* **20**(1):31-36.

Choudhary, M., Rana, K.S., Rana, D.S. and Bana, R.S. 2016.Tillage and crop residue effects in rainfed pearl millet in conjunction with sulphur fertilization under pearl millet (*Pennisetum glaucum*)–Indian mustard (*Brassica juncea*) cropping system. *Indian J. Agron.,* **61**(1):15-19.

Gupta, V. 2018. Effect of weed management and nutrient application on productivity of quality protein maize (*Zea mays* L.) and their residual effect on succeeding wheat (*Triticum aestivum* L.). Ph. D. Thesis, Department of Agronomy, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India.

Gupta, V., Sharma, A., Kumar, J., Abrol, V., Singh, B. and Singh, M. 2014.Effects of integrated nutrient management on growth and yield of maize (*Zea mays* L.)-gobhi sarson (*Brassica napus* L.) cropping system in sub-tropical region under foothills of north-west Himalayas. *Bangladesh J. Bot.,* **43**(2): 147-155.

Li, W., Lin, S.S., and Tan, Y.Z. 2000. Innovated techniques on comprehensive utilization of crop straw. *Transactions of the CSAE,* **16**:14-17.

Karunakaran, V. and Behera, U.K. 2013.Effect of tillage, residue management and crop establishment techniques on energetics, water use-efficiency and economics in soybean–wheat cropping system. *Indian J. Agron.,* **58**(1): 42-47.

Kumar, V. and Singh, S. 2019.Effect of fertilizers, biofertilizers and farmyard manure on sustainable production of Indian mustard (*Brassica juncea*). *Ann. Plant Soil Res.,* **21**(1): 25-29.

Kumpawat, B.S. 2010. Integrated nutrient management in blackgram (*Vignamungo*) and its residual effect on succeeding mustard (*Brassica juncea*) crop. *Indian J. Agric. Sci.,* **80**(1): 76-79.

Pawar, V.R., Suryawanshi, S.U., Tambe, A.D. and Patil, S.P. 2013. Effect of different organic inputs on yield, economics and microbial count of sweet corn (*Zea mays* var. saccharata). *Inter. J. Ecol., Env. Conserv.* **19**: 865-868.

Shannon, D., Sen, A.M. and John, D.B. 2002. A comparative study of the microbiology of soils managed under organic and conventional regimes. *Soil Use Managem.,* **18**: 274-283

Shukla, S.K., Singh, P.N. and Chauhan, R.S. 2011. Effect of organic wastes amended with *Trichoderma* and *Gluconacetobacter* on physicochemical properties of soil and sugarcane ratoon yield., in UdicUstochrept. *Indian J. Agron.* **56**(3): 254-259.

Singh, P.K., Kushwah, V.S. and Lal, S.S. 2011. Integrated nutrient management in black gram-potato-wheat sequence. *Potato J.* **38**(2): 170-175.

Singh, V. 2020. Effect of integrated nutrient management on yield and uptake of nutrients in pearl millet (*Pennisetum glaucum*)-mustard (*Brassica juncea*) crop sequence. *Ann. Plant Soil Res.,* **22**(4): 349-353.