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Effect of Integrated Nutrient Management of Oat on Succeeding Maize Crop

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ABSTRACT

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The treatments comprised of three varieties of oat (Kent, JHO 822, JHO 851) as the main plot treatments and nine integrated nutrient management viz; 50 % of Recommended dose of Fertilizer (RDF) (F₁), 75 % of RDF (F₂), 100 % of RDF (F₃), 50 % of RDF + Vermi Compost (F₄), 50 % of RDF + *Azotobacter* (F₅), 50 % of RDF + Vermi Compost + *Azotobacter* (F₆), 75 % of RDF + Vermi Compost (F₇), 75 % of RDF + *Azotobacter* (F₈) and 75 % of RDF + Vermicompost + *Azotobacter* (F₉) as the sub plot treatments followed by maize crop. Number of plants m⁻², plant height, 1000-grain weight and grain yield of maize affected significantly by different nutrient management treatments given to previous oat crop. More number of maize plants m⁻², plant height, 1000-grain weight were noted in plots previously treated with 75 % of RDF + Vermi Compost + *Azotobacter* which was statistically equal to that of 50 % of RDF + Vermi Compost + *Azotobacter* followed by 75 % of RDF + Vermi Compost.

Introduction

Maize (*Zea mays* L) is also an important crop as a source of food and maize straw used as livestock feed in India which is grown in *kharif* season after oat.

The application of organic manure and bio-fertilizer in oat crop may have the residual effect on maize grain yield during subsequent planting season. Addition of organic manures to cultivated land helps recycle nutrients and

reduce fertilizer costs in crop production systems. Moreover, the soil nutrient availability derived from organic manure application is not well known. In addition, application of organic manure or others organic wastes may also generate a positive residual effect that should be taken into account when planning the next crop (Eghball *et al.*, 2014; Hirzel *et al.*, 2007).

Rowell (1994) describes it as reasons to fertilizers after the first season of application.

Warren (1992) considers the attribute as a rather loose way of indicating benefit from old fertilizer application in subsequent seasons. Assessment of residual effects is of benefit to smallholder farmers as it aims at reducing fertilizer inputs.

The presence of residual effects in nitrogen application therefore has implications on fertilizer management strategies in subsequent planting seasons. Residual effect of fertilizer can greatly affect the yield.

The residual N effect obtained with organic residues is mainly because some N is adsorbed or incorporated into the clay and organic soil fraction and is immobilized by soil microbial biomass (Jensen *et al.*, 2015; Sainz *et al.*, 2004). Sorensen and Amato (2002) found that the residual N effect associated with the application of pig slurry to a barley (*Hordeum vulgare* L.) and ryegrass (*Lolium perenne* L.) crop rotation were about 2 to 4% and 1 to 3% of the N applied as manure in the second and third year, respectively.

Materials and Methods

The experiment was conducted in Agricultural Research Farm of Amar Singh (PG) College, Lakhaoti, Bulandshar (U.P.) during 2009-10 and 2010-11 on a well drained sandy loam soil. The experiment was carried out at the same site and layout during both the years.

The experimental site is situated at a latitude of 28.4° North and longitude of 77.1° East with an altitude of 207.1 metre above the mean sea level. Generally, temperature is maximum during May-June and lowest in December-January. The experiment was laid out in factorial randomized block design with three replications at the same site during both the years.

A. Varieties:

- i. Kent (V₁)
- ii. JHO – 822 (V₂)
- iii. JHO – 851 (V₃)

B. Fertilizer Management:

- i. 50 % of Recommended dose of Fertilizer (RDF) (F₁)
- ii. 75 % of RDF (F₂)
- iii. 100 % of RDF (F₃)
- iv. 50 % of RDF + Vermi Compost (F₄)
- v. 50 % of RDF + Azotobactor (F₅)
- vi. 50 % of RDF + Vermi Compost + Azotobactor (F₆)
- vii. 75 % of RDF + Vermi Compost (F₇)
- viii. 75 % of RDF + Azotobactor (F₈)
- ix. 75 % of RDF + VermiCompost + Azotobactor (F₉)

Observation taken in maize crop: Number of plants/m², Plant height, 1000 grain weight (g) and Yield (kg/ha).

Results and Discussion

Number of plants m⁻², plant height, 1000-grain weight and grain yield of maize affected significantly by different nutrient management treatments. More number of maize plants m⁻², plant height, 1000-grain weight were noted in plots previously treated with 75 % of RDF + Vermi Compost + *Azotobactor* which was statistically equal to that of 50 % of RDF + Vermi Compost + *Azotobactor* followed by 75 % of RDF + Vermi Compost.

This may be due to soil fertility (N, P and organic carbon) was improved significantly with Vermi Compost used either alone or in combination with fertilizer over that of initial soil status. Rashid Saleem (2017) also reported that wheat yield increased by 20 % with the application of sole poultry manure @ 15 t ha⁻¹ and 15 % increase in response to complementary application of fertilizers in preceding seasons (Table 1).

Table.1

Treatments	Number of plant/m ²		Plant Height (cm)		1000-grain weight (g)		Grain yield (kgha ⁻¹)	
	2009-10	2009-10	2009-10	2009-10	2010-11	2010-11	2010-11	2010-11
Varieties								
Kent (V₁)	9.46	165.25	236.78	2956.85	3316.45	238.12	163.95	9.32
JHO 822 (V₂)	9.33	156.96	239.64	3259.59	3564.14	241.45	158.56	9.05
JHO 851 (V₃)	9.41	162.25	234.12	3284.98	3373.98	236.22	161.23	9.13
SEm±	0.17	3.75	3.68	125.69	113.56	4.25	3.45	0.17
CD (5%)	NS	9.56	NS	NS	NS	NS	8.78	NS
Fertilizer Management								
50 % of RDF (F₁)	9.31	139.71	232.67	2983.59	3376.85	234.32	142.25	9.11
75 % of RDF (F₂)	9.32	152.56	240.87	3284.75	3420.35	242.54	147.99	9.05
100 % of RDF (F₃)	9.41	159.85	245.56	3476.85	3459.85	246.78	145.26	9.23
50 % of RDF + Vermi Compost(F₄)	9.46	154.89	249.48	4167.75	4578.23	251.46	158.89	9.31
50 % of RDF + Azotobactor (F₅)	9.44	148.89	243.12	4058.46	4167.85	243.89	149.58	9.38
50 % of RDF + Vermi Compost + Azotobactor (F₆)	9.62	167.25	249.89	4589.56	4798.56	253.45	163.59	9.52
75 % of RDF + Vermi Compost (F₇)	9.56	171.25	247.48	4570.24	4695.85	249.25	173.56	9.61
75 % of RDF + Azotobactor (F₈)	9.51	165.89	246.89	4552.59	4896.36	248.46	169.56	9.48
75 % of RDF + Vermi Compost + Azotobactor (F₉)	9.67	179.25	253.15	4732.56	5412.56	255.22	183.59	9.61
SEm±	0.08	3.93	2.85	112.58	109.85	3.54	3.59	0.09
CD (5%)	0.25	9.74	6.11	325.25	296.89	8.97	9.12	0.26

Better yield was achieved due to increased fertility because leguminous crops enriched soil through fixation of atmospheric nitrogen in their root nodules, which in turn supply residual food nutrients to the succeeding crop. Secondly, poultry manure application not only supplied residual nutrients for the following crop but also reduced the bulk density of soil.

References

- Eghball B, Ginting D, Gilley JE (2014). Residual effects of manure and compost applications on corn production and soil properties. *Agron. J.* 96:442-447.
- Hirzel, J., I. Walter, P. Undurraga, and M. Cartagena. (2007). Residual effects of poultry litter on silage maize (*Zea mays* L.) growth and soil properties derived from volcanic ash. *Soil Sci. Plant Nutr.* 53:480-488.
- Jensen, L.S., I.S. Pedersen, T.B. Hansen, and N.E. Nielsen. (2015). Turnover and fate of ¹⁵N-labelled cattle slurry ammonium-N applied in the autumn to winter wheat. *Eur. J. Agron.* 12:23-35.
- Rashid Saleem (2017). Economic feasibility of integrated nutrient management for sustainable rainfed maize-legume based intercropping systems. PhD thesis. Department of Agronomy, Faculty of Crop and Food Sciences, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan.
- Rowell, D. L. (1994). *Soil science: Methods and applications*. 350pp: John Willey & Sons, Ins 605 Third Avenue, New York, USA.
- Sainz, H.R., H.E. Echeverría, and P.A. Barbieri. (2004). Nitrogen balance as affected by application time and nitrogen fertilizer rate in irrigated no-tillage maize. *Agron. J.* 96:1622-1631.
- Sorensen, P. and Amato, M. (2002). Remineralisation and residual effects of N after application of pig slurry to soil. *European Journal of Agronomy*, 16, 81–95.
- Warren, G.I (1992): *Fertilizer Phosphorus. Sorption and Residual Value in Tropical African Soils*. AR! Bulletin 37, Natural Resources Institute, Catham, UK.

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