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Effect of NPK in the management of Alternaria black spot disease severity, seed yield and oil content of mustard

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Abstract
An experiment was conducted to evaluate the effect of NPK against the management of Alternaria black spot disease, productivity and oil content of mustard during 2015-16 and 2016-17 in the rabi seasons in the Krishi Vigyan Kendra, Katni (MP) with three doses of nitrogen, potassium and constant phosphorus. In the year 2015-16, each increased dose of nitrogen, there was a significantly increase in percent disease incidence on leaf from 26.66% to 47.41% and zero level of nitrogen shown less disease incidence (33.44% to 35.39%).Minimum incidence of disease (19.33%) in the year 2015-16 was recorded in the treatment applied 120kg nitrogen and 60kg potash. Increased dose of potash from 60kg to 80kg/ha with 120kg nitrogen increased the disease incidence (19.33% to 29%). Overall disease incidence on leaf increased with increase the nitrogen dose from 120kg to 160kg/ha with 80kg/ha potash. Highest disease incidence (47.41) was recorded in treatment given160kg N and 40kg K. Same trend of disease incidence on leaf was found in the year 2016-17. The highest seed yield (20.66q/ha)was achieved in 120kg N 60kg K along with 40kg P (Constant) applied plot followed by 140kg N and 60kg K (17.96q/ha and 120kg N plus 40kg K in the year 2015-16.There were no differences in seed yield among the treatment 1, treatment 3,treatment 4and treatment 6. Minimum seed yield (10.33q/ha) was obtained in control plot. In the year 2016-17, maximum yield (18.91q/ha) was recorded in plants receiving the 120kg N and 60kg K which was significantly higher than all the treatment plots. There was increased in yield with increase in K level from 40kg to 60kg/ha. Oil content was significantly decrease when plant were raised under higher doses of N and K. Significantly more oil percent (40.13%) was recorded in treatment applied 120kg N and 60 kg K followed by 120kg N and 40kg K (39.35) in comparison to control plot. Same trend of the oil recovery was also recorded in the year 2016-17.

Keywords: Mustard seed, *alternaria brassicae*, NPK fertilizers, sprayer etc.

Introduction
Rapeseed and mustard (*Brassica* spp.) is one of the most cruciferous edible oil seed crops, contributing approximately twenty five percent total oil production in India. Among the oil seed crops production of rapeseed mustard is 8.2mt in 6.7 m ha of land (GOI 2011).This crop is affected by numbers of diseases limiting productivity of crop over a wide area and among them Alternaria blight caused by *Alternaria brassicae* (Berk) Sacc has been reported from all the continent of the world and is considered as important constraint in production and productivity of Brassicae family causing up to 47% yield loss (Kolte *et al*. 1987, Meena *et al*.2012) [8, 12]. Average yield losses have been recorded in the range of 10 to 70 percent (Shrestha *et al*. 2005) [17] depending upon prevailing weather and disease situation. In addition to direct losses of yield, it also affects the quality of seeds, its germination by reducing seed size, seed colour and oil content (Kaushik 1984) [6] Though the disease can be managed to some extent by the use of fungicides (Sultana *et al*. 2009) [20] but environmental pollution, human health and development of fungicides resistant strain in plant pathogen are the major problems in various regions due to injudicious and untimely application of fungicides. And challenged the plant pathologist to search for eco-friendly nontoxic chemicals for substituting the recommended fungicides in recent years (Meena *et al*. 2013) [13] Use of mineral nutrition has long been recognized as an important component for disease management practices

(Agrios, 2005) [1] Application of nitrogen (N) without phosphorus (P) or potash (K) is reported to increase severity of leaf spot of radish (Sandhu *et al*. 1985) [15] and leaf spot of eggplant (Singh 1988) [18]. However, the severity of leaf spot of cotton was decrease by the application of potash (Hillocks and Chinodya 1989) [4] The present study has been conducted to obtain suitable infor4mation regarding Alternaria disease management and yield attributes through the application of eco-friendly plant nutrients in Indian mustard.

Material and Methods

The experiment was conducted under Krishi Vigyan Kendra, Katni-Madhya Pradesh, and India during 2015-16 and 2016-17 in Rabi season. Before going to plan the experiment soil sample collected and analyzed for the availability of NPK, Ph and organic carbon present in the soil of the experimental field. Analysis of soil samples completed by the Deportment of soil science and Agricultural Chemistry, JNKVV, Jabalpur (Table 1). Experimental treatment comprises six different combination of N and K with constant P (40kg/ha). Applied urea for N source (120kg, 140 kg and 160kg/ha), Single Supper phosphate for P and muriate of potash for full fill the amount of K2O (40kg, 60kg and 80kg/ha). The half of the N and full rate of P and K were applied as the basal dose to the soil twelve hours before sowing. The sowing was done in the first week of November in both the years. The remaining half of the N was broad cost in two equal doses i.e. 40 and 60 days, respectively. The plot size of each treatment was 3x2 m where five rows of 3meter length were maintained in three replication under randomized block design. Average disease index on leaf was recorded at 80, 90 and 100 days and on pod at 100 days after sowing. For recording disease observations, twenty five leaves and 25 pods were randomly selected from each replication and rated as per disease rating scale given by Verma and Saharan, 1994 and average disease index was calculated by McKinney (1923) [11] formula. Yield component oil content and cost benefit ratio were calculated and pooled disease data on leaves and pods were statistically analyzed to determine the least significant differences. Soil analyzed report given in Table 1

Table 1: The least significant differences. Soil analyzed report given

Analyzed content	Availability kg/ha		Average of two years
	2015-16	2016-17	
N	204.8	237.71	221.25
P	14.78	15.9	15.34
K	176.10	149.28	162.69
OC	0.52	0.59	0.55
pH	7.04	7.17	7.11

Results and Discussion

Soil testing report indicated that two year average availability of NPK were 221.25:15.34:162.69 kg/ha, respectively. Organic carbon availability in the field was 0.55 and PH was neutral (7.11) (Table 1). Results of the experiment indicated that the disease and yield showed different reactions on each year which is due to change of the climatic conditions during the crop period in the field. The black spot disease on leaf in the year 2016-17 was more than 2015-16. In the year 2015-16, each increased dose of nitrogen, there was a significantly increase in percent disease incidence on leaf from 26.66% to 47.41% and zero level of nitrogen shown less disease incidence (33.44% to 35.39%). Minimum incidence of disease (19.33%) in the year 2015-16 was recorded in the treatment applied 120kg nitrogen and 60kg potash. Increased dose of potash from 60kg to 80kg/ha with 120kg nitrogen increased the disease incidence (19.33% to 29%). Overall disease incidence on leaf increased with increase the nitrogen dose from 120kg to 160kg/ha with 80kg/ha potash. Highest disease incidence (47.41%) was recorded in treatment given 160kg N and 40kg K (Table 2). Same trend of disease incidence on leaf was found in the year 2016-17. The two year pooled mean data also showed similar type of results that with increase in N doses there was a significantly increase in percent leaf infection and zero level of N showed least percent of infection. Among the applied N level minimum disease incidence was found in 120kg/ha (20.96) followed by 140kg (40.3%) and maximum in 160kg (48.58%). Percent black spot disease (BSD) on pods were also recorded and found that increase level of N with K increase the disease. BSD index on pod was found lowest in the plant receiving 120kg of N and 60 kg per hectare K (26.33%) which was statistically at par with 120kg N plus40kg k (31%) in the year 2015-16. Highest BSD index percent on pod was recorded at 160kg N plus40kg K (49.66%). In the year 2016-17,application of 120kg N with 60kg K showed significantly minimum disease (23.91%) followed by 120kg N and 40kg K in comparison to higher dose of N (140kg/ha) and K(80kg/ha).As the dose of K increased from 60kg to 80kg, disease incidence was also increased. No significant difference in BSD incidence was noted in treatment fertilized with 140kg N with 80kg K (44%) and 160kg N plus 40kg K (49.66%), respectively. Whereas 33.33 to 35.41% incidence was recorded in control plot. Khatun *et al*. (2011) [7] reported that higher doses of nitrogen increased the Alternaria leaf blight infection in mustard. Higher dose of nitrogen than recommended dose enhanced the severity and incidence of various diseases caused by *Alternaria brassicicola*, *A. porri* and *Alternaria* spp. (Dasgupta *et al*.1991) [2]. Mahapatra *et al*. (2014) [10] reported that application of 160kg/ha N increased the incidence of Alternaria blight of mustard on leaf and siliqua. Kumar *et al*. (2015) [9] concluded that under natural condition, calcium sulphate, potassium chloride, borax and zinc sulphate reduced the disease incidence of Alternaria blight and increased the yield. Sharma and Kolte (1994) [16] reported that nitrogen with potassium fertilized plant decreased the incidence of black spot disease and increases phenolic content in plant. This had reflected in reduced seed infection of *Alternaria brassicae* in case of K (alone) or NK fertilized plants and reported to cause increase in carbohydrates and phenolic compound in the plant tissues consequently making plants resistant to pathogen. K is also important in carbohydrate and phenol metabolism in plants. The highest seed yield (20.66q/ha) was achieved in 120kg N 60kg K along with 40kg P(Constant) applied plot followed by 140kg N and 60kg K(17.96q/ha and 120kg N plus 40kg Kin the year 2015-16.There were no differences in seed yield among the treatment 1,treatment 3,treatment 4and treatment 6. Minimum seed yield (10.33q/ha) was obtained in control plot. In the year 2016-17, maximum yield (18.91q/ha) was recorded in plants receiving the 120kg N and 60kg K which was significantly higher than all the treatment plots. There was increased in yield with increase in K level from 40kg to 60kg/ha. Higher dose of P (45kg/ha) and K (90kg/ha) showed no appreciable effect on seed yield (Khatun *et al*., 2011) [7]. It was observed that higher doses of N (140kg/160kg) with potassium not only increased the disease but also reduced the seed yield in both the years. Singh *et al*. (2003) [19] observed that the N level higher than 120kg/ha did not significantly increase the yield and yield attributes. Khatun *et al*. (2011) [7] found that increasing dose of

potassium with certain level of nitrogen increase the yield. Kahlon *et al*. (2011) [5] reported that with increase in potassium level onion bulb yield was increased and positive correlation was found between bulb yield and bulb diameter. Report of Regmi and Shrestha (2018) [14] indicated that 75kg MOP/ha is the best in reducing the Alternaria leaf spot along with increasing the yield of radish. Oil content was significantly decrease when plant were raised under higher doses of N and K. Significantly more oil percent (40.13%) was recorded in treatment applied 120kg N and 60 kg K followed by 120kg N and 40kg K(39.35) in comparison to control plot. Same trend of the oil recovery was also recorded in the year2016-17. Finding of present investigation concluded that potassium decreases the incidence of black leaf spot disease and the seed yield increases with the increase their level up to 60kg/ha with 120kg/ha nitrogen. If the level of nitrogen and potassium increased more than 120:60 ratios, enhanced the incidence of disease and reduced seed yield and oil content. The NPK ratio in 120:40:60 kg/ha found the most effective combination to reduced Alternaria black leaf spot disease and increased seed yield and oil percent in mustard.

Table 2: Effect of NPK on Alternaria black spot disease, yield and oil content in mustard.

Treatment N:P:K	Leaf Infection (%)		Pooled	Pod Infection (%)		Pooled	Yield(q/ha		Oil Content (%)	
	2015-16	2016-17		2015-16	2016-17		2015-16	2016-17	2015-16	2016-17
T1 (120:40:40)	26.66	29.33	27.99	31.00	32.06	31.53	15.60	14.63	39.35	39.37
T2 (120:40:60)	19.34	22.59	20.96	26.33	23.91	25.12	20.66	18.91	40.13	39.66
T3 (120:40:80)	29.00	32.33	30.66	38.66	40.05	39.35	15.38	13.59	39.02	39.15
T4 (140:40:40)	35.00	37.53	36.26	42.75	44.33	43.54	15.05	13.15	39.31	39.00
T5 (140:40:60)	38.74	41.66	40.20	39.33	42.47	40.90	17.96	15.66	39.19	38.79
T6 (140:40:80)	42.73	46.33	44.53	44.00	46.91	45.45	14.50	14.13	38.73	38.28
T7 (160:40:40)	47.41	49.75	48.58	49.66	48.00	48.83	13.91	12.42	38.01	37.84
T8 (Check)	33.44	35.33	34.38	31.33	35.41	33.37	10.33	9.84	37.12	36.20
CD (0.05%)	6.46	5.27	5.78	6.71	4.14	3.93	2.11	2.87	0.53	0.37

References

1. Agrios GN. Plant Pathology.5th Edn, Elsevier Academic Publishers, California, USA, 2005, 922.
2. Dasgupta B, Ghosh PK, Chaterjee BN. Effect of different date and levels of nitrogen fertilizers on Alternaria blight disease and productivity of Indian mustard (*Brassica juncea*). Czern and Coss. Environment and Ecology, 1991; 9:118-123.
3. GOI. Agricultural statistics at a Giance-2011, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, 2011.
4. Hillocks RJ, Chinodya R. The relationship between Alternaria leaf spot and potassium deficiency causing premature defoliation of cotton. Plant pathology. 1989; 38:502-508.
5. Kahlon MS. Response of onion to irrigation and potassium application. Research on crops. 2011; 12:539-544.
6. Kaushik CD, Kaushik JC, Sharma GS. Field evaluation of fungicides for the control of Alternaria leaf blight of Brassica juncea. J Mycol. Pl. Pathol, 1984, 9-18.
7. Khatun F, Alam MS, Husan MA, Alam S, Malaker PK. Effect of NPK on the incidence of Alternaria leaf blight of mustard. Bangladesh J Agri. Res. 2011; 36:407-413.
8. Kolte SJ, Awasthi RP, Vishwanath. Assessment of yield losses due to Alternaria blight in rapeseed and mustard. Indian Phytopath. 1987; 40:209-211.
9. Kumar A, Kumar S, Kumar R, Chand G, Kolte SJ. *In vitro* and *in vivo* effect of eco-friendly chemicals on Alternaria blight disease (*Alternaria brassicae*) and yield attributes in Indian mustard (*Brassica juncea*). J Appl. & Nat. Sci. 2015; 7:43-51.
10. Mahapatra S, Saha P, Das S. Effect of different level of nitrogen in field on Alternaria blight severity of mustard. J Mycopathol. Res. 2014; 52:35-40.
11. Mckinney HH. Influence of soil temperature and moisture on infection of wheat seedlings by *Helminthosporium sativum*. Journal of Agriculture Research. 1923; 26:195-217.
12. Meena PD, Rani A. Meena R, Sharma P, Gupta R, Chowdappa P. Aggressiveness, diversity and distribution of *Alternaria brassicae* isolates infecting oil seed brassica in India. African Journal of Microbiology Research. 2012; 6:5249-5258.
13. Meena PD, Gour RB, Gupta JC, Singh HK, Awasthi RP, Netam RS *et al*. Non chemical agents provide tenable, eco-friendly alternative for the management of the major diseases devastating Indian mustard (*Brassica juncea*). in India. Crop Protection. 2013; 53:169-174.
14. Regmi S, Shrestha RK. Effect of potassium on disease severity of Alternaria leaf spot in radish. Acta Scientific Agriculture. 2018; 2:91-95.
15. Sandhu KS, Singh H, Kumar R. Effect of different nitrogen levels and date of planting on Alternaria blight and downy mildew disease of radish seed crop. J Res. Panjab Agric. Univ. 1985; 22:285-290
16. Sharma SR, Kolte SJ. Effect of soil applied NPK fertilizers on severity of Black spot disease (*Alternaria brassicae*) and yield of oilseed rape. Plant and Soil. 1994; 167:313-320.
17. Shrestha SK, Munk L, Mathur SB. Role of weather on Alternaria leaf blight disease and its effect on yield and yield component of mustard. Nepal Agric. Res J. 2005; 6:62-72.
18. Singh M. Effect of interaction of nitrogen, phosphorus and potash on Alternaria leaf spot and fruit rot of brinjal. Farm Sci. J. 1988; 3:21-23.
19. Singh GK, Kedar P, Prasad K. Effect of row spacing, nitrogen levels and basis of nitrogen application on yield attributes and yield of mustard variety Basanti. Crop Res. Hisar. 2003; 25:427-430.
20. Sultana NA, Khan MAH, Islam MN, Nahar K. Evaluation of appropriate time for the application of rovral against alternaria blight incidence and yield of mustard. International journal of Sustainable Agriculture. 2009; 1:20-23.