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Enhancing Livelihood Security in Arid Land through Use of Bio-pesticides in Cumin(Cuminum cyminum L.)

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Abstract Assessment of the use of improved varieties of cumin (RZ-209 and GC-4) along with treatments of two low cost ecofriendly biopesticides, i.e. soil application of neem cake (NC) and seed treatment with Aspergillus versicolor (Av) were conducted in the farmer's fields at 65 locations in Bheenjwadia village Jodhpur district during rabi seasons of 2010 to 2013. Application of NC in improved variety, increased seed yield by 16.85 and 20.73 % in GC-4 and RZ-209 respectively, over control. Similarly, seed yield of cumin was obtained 18.77 % higher due to use of NC in local variety. Use of neem cake in improved and local variety of cumin provided Rs.3466, Rs.3400 and Rs.5300/ha in local, GC-4 and RZ-209 as net returns over control. A net returns was obtained Rs. 2627, Rs.2110 and Rs. 2193/ha in local, GC-4 and RZ-209 respectively due to seed treatment with Av. as compared to control.

Keywords Cumin, Neem Cake, Aspergillus Versicolor

1. Introduction

Cumin is a low water requiring high value crop of arid zone having export of Rs 200 million year[1]. It occupies about 4.95 lakh ha area with total production of 1.76 lakh tones (2012-13) in Rajasthan. The average productivity of cumin is very low (356kg ha^{-1}) as compared to its potentiality (850 kg ha^{-1}) in Rajasthan. Being high value export crop quality production is highly desirable. However, due to high use of pesticide like organo-phosphate and others the residue in the produce is becoming major constraint for export. Therefore, the study was conducted in a village Bheenjwadia of Jodhpur district to produce cumin with the use of bio-pesticides i.e. neem cake and Aspergillus versicolor (brand name Marusena).A. versicolor has been reported as effective wilt control bio-agent by various researchers Deepak and Lal [1],Singh *et al*. [2] and Singh *et al*.[3].

2. Material and Methods

Assessment of the use of improved varieties of cumin (RZ-209 and GC-4) along with neem cake (NC) of 3.5% oil content and seed treatment with Aspergillus versicolor were conducted at the farmer's fields at 65 locations in Bheenjwadia village Jodhpur district during *rabi* seasons of 2010-11 to 2012-13. Treatment set one of bio-pesticides i.e. neem cake was applied @400 kg ha^{-1}at the time of last ploughing in and were compared with control. Neem cake has been reported by various workers Kimaru *et. al*. [4] and Singh *et.al.* [5] as an effective material for controlling fungal diseases. Treatment set two of bio-pesticides i.e. seed was treated with bio-control agent Aspergillus versicolor@ 6 g/kg seed before sowing and were compared with control.

3. Results and Discussion

Effect of Neem Cake on Seed Yield of Cumin

The mean seed yield of cumin varieties GC-4 and RZ-209 was obtained 498.50 kgha^{-1} and 524.33 kgha^{-1}respectively. Application of NC @400kgha^{-1}, seed yield of cumin varieties GC-4 and RZ-209 was recorded 582.50 kgha^{-1} and 627.33kgha^{-1} respectively. Application of NC in improved variety, increased seed yield by 16.85 and 19.64 % in GC-4 and RZ-209 respectively, over control (Table-1). The mean seed yield of local variety was obtained 451.00 kgha^{-1}.Application of NC in local variety; seed yield was recorded 535.66 kg ha^{-1}. The seed yield of cumin was 18.77 % higher due to use of NC in local variety. Use of neem cake in improved and local variety of cumin provided Rs.3466, Rs.3400 and Rs.5300 ha^{-1} in local, GC-4 and RZ-209 respectively as net returns with this treatment only, over control (Table 1) with the investment of Rs. 5000 only.

Table 1. Effect of variety and neem cake on the net returns in cumin (2010-11 to 2012-13)

Treatments	Seed yield kg ha $^{-1}$	% yield increase	Yield increased over the treatment (Kg ha $^{-1}$)	Cost of treatment (Rs ha^{1})	Net returns with the treatment of neem cake only (Rs.ha^{-1})
Local	451.00	-	=	=	-
Local + neem cake	535.66	18.77	84.66	5000	3466
GC-4	498.50	-	-	-	-
GC-4 + neem cake	582.50	16.85	84	5000	3400
RZ-209	524.33	-	-	-	-
RZ-209 + neem cake	627.33	19.64	103	5000	5300

Note : Price of cumin Rs.100 kg^{-1}

Table 2. Effect of marusena (*Aspergillusversicolor)* on the net returns in cumin crop (2010-11 to 2012-13)

Treatments	Seed yield kg ha $^{-1}$	% yield increase	Yield increased over the treatment (Kg ha^{-1})	Cost of treatment (Rs ha^{-1})	Net returns with the treatment of marusena only (Rs. ha^{-1})
Local	443.33	-	=	=	-
Local + Marusena treatment	470.00	6.01	26.67	40	2627
GC-4	493.50	-	-	-	-
GC-4 + Marusena treatment	515.00	4.35	21.50	40	2110
RZ-209	497.00	-	-	-	-
RZ-209 + Marusena treatment	519.33	4.49	22.33	40	2193

Note: Price of cumin Rs.100 kg^{-1}

Effect of Marusena (*Aspergillus Versicolor)* on Seed Yield of Cumin

The data presented in Table 2 revealed that mean seed yield of cumin varieties GC-4 and RZ-209 was obtained 493.50 kg ha^{-1}and 497.00 kgha^{-1} respectively. Seed treatment with marusena, seed yield of cumin varieties GC-4 and RZ-209 was recorded 515 kg ha^{-1} and 519.33 kg ha^{-1}respectively with. Seed yield increased by 4.35 and 4.49 % in GC-4 and RZ-209 respectively due to seed treatment with marusena, over control (Table-2). The mean seed yield of local variety was obtained 470.00 kgha^{-1} with seed treatment with marusena as compared to 443.33 kg ha^{-1} in control. A net returns with this treatment only, was obtained Rs.2627, Rs.2110 and Rs.2193ha^{-1} in local, GC-4 and RZ-209 respectively due to seed treatment with marusena as compare to control(Table 2) with the investment of Rs 40 only.

Farmers showed favorable to most favorable attitude about technologies. These eco-technologies not only cost effective, easily applicable but also enhanced export possibilities due to pesticide free produce.

4. Conclusions

It can be concluded that application of neem cake (NC) in improved variety, increased seed yield by 16.85 and 19.64 % in GC-4 and RZ-209 respectively, over control. Similarly, seed yield of cumin was obtained 18.77 % higher due to use of NC in local variety. Seed treatment of cumin varieties with *Aspergillus versicolor* (brand name marusena), increased seed yield by 4.35, 4.49 and 6.01 per cent in GC-4, RZ-209 and local respectively. Use of neem cake in improved and local variety of cumin provided Rs.3466, Rs.3400 and Rs.5300 ha^{-1} in local, GC-4 and RZ-209 as net returns over control with the investment of Rs.5000. A net returns was obtained Rs.2627, Rs.2110 and Rs.2193ha^{-1} in local, GC-4 and RZ-209 respectively due to seed treatment with marusena as compared to control with the investment of Rs 40 only. Therefore, both the inputs are ecologically and economically viable for using in cumin crop production.

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