Himachal Journal of Agricultural Research 46 (2) : 156-161 (2020)

Evaluation of IDM components for the management of urdbean anthracnose caused by *Colletotrichum truncatum* (Schwein) Andrus and Moore

Shiney Chatak* and D.K. Banyal

Department of Plant Pathology
CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur-176 062, India.

*Corresponding author:shineychatak111@gmail.com
Manuscript received: 23.07.2020; Accepted: 25.08.2020

Abstract

Urdbean (*Vigna mungo* L. Hepper*)* also known as mash or blackgram is important *Kharif* pulse.It suffers from many diseases in which anthracnose leaf spot caused by *Colletotrichum truncatum* (Schwein) Andrus and Moore occur in endemic form in high rainfall areas and result in qualitative and quantitative yield losses. The field experiments on integrated management of anthracnose revealed that among organic and natural inputs, three sprays of panchgavya (@10%) at ten days interval gave maximum disease control of 33.64 per cent with 26.14 per cent yield increase whereas crude extract of botanicals i.e. *Melia azedarach* (Darek), *Eucalyptus* sp. (eucalyptus), *Eupatorium odoratum* (Basuti) and *Lantana camera* (lantana) three foliar sprays of eucalyptus (@30%) at 10 days interval gave maximum disease control of 28.18 per cent with 21.62 per cent increase in yield. The seed treatment with bioagents *viz; Trichoderma koningii* (DMA-8), *Trichoderma koningii* (JMA-11), *Trichoderma harzianum* (SMA-5), *Trichoderma harzianum* (TH-11) and *Trichoderma viride* was less effective and gave only 4.88 to 10.98 disease control with 2.79 to 6.04 per cent yield increase. all the five fungicides *viz;* mancozeb 75WP, carbendazim 50WP, propiconazole 25EC, tebuconazole 25EC and trifloxystrobin 25% + tebuconazole 50% were found effective and gave 42.58 to 77.99 per cent disease control with 33.12 to 43.18 per cent yield increase over check.

Key words: Urdbean, Anthracnose**,** *Colletotrichum truncatum,* IDM components.

Urdbean (*Vigna mungo* L. Hepper) also known as mash or blackgram is important *Kharif* pulse crop originated from India. It is mainly consumed in form of pulse and have high nutrition content *viz;* protein (25gm/100gm), potassium (983mg/100g), calcium (138mg/100g), iron (7.57mg/100g), niacin (1.447mg/100g), thiamine (0.273mg/100g), riboflavin (0.254mg/100g) and many other essential amino acids (Singh *et al*. 2016).Global production of urdbean is 25.23 million tons from 29 million hectare area with productivity 8.49 q/ha. It is mostly cultivated in South-Asian countries *viz;* India, Myanmar, Singapore, Thailand, New Zealand, Hong Kong, Sri Lanka and Pakistan (Anonymous 2011). India is the largest producer as well as consumer of urdbean in world with annual production of 3.56 million tons from 5.44 million hectare net area with average productivity of 6.55q/ha (Anonymous 2018) that contributes to about 70 per cent of total world production followed by Myanmar and Pakistan. In Himachal Pradesh, it is cultivated mainly in low and mid-hill zone as intercrop with maize or on rice field bunds over 7.20 million hectare area giving 2.90 thousand tons annual production with average productivity of 4.67q/ha (Anonymous 2018).

Sustainable production of urdbean is affected by large number of diseases in which anthracnose caused by *Colletotrichum truncatum* (Schwein) Andrus and Moore is major seed and foliar disease causing serious losses. The disease caused yield losses ranging from 39 to 65 per cent (Gupta *et al.* 2007) and the losses can be reduced by 35.2 to 88.9 per cent with proper management practices (Joshi and Tripathi 2002). In Himachal Pradesh, the disease is endemic in high rainfall regions of mid hill zone with average disease severity ranging from 4.8 to 47.7 per cent (Sharma, 1996) causing upto 34.6 per cent annual yield losses (Bhardwaj and Thakur, 1991).Therefore, considering the devastating nature of chemicals and economic losses of the disease, present study was aimed to evaluate different integrated disease management practices alongwith fungicides.

Materials and Methods

To evaluate different management components under field conditions four experiments were conducted at the experimental farm of Department of Plant Pathology, CSKHPKV, Palampur during *Kharif* 2019. Seed of susceptible variety Him Mash-1 were sown in plot of size 2.5x1 m^2 with row-to-row spacing of 30 cm following recommended Package of Practices.

Data on disease severity were recorded before each spray and one week after last spray along with data on seed yield taken in g/ plot and converted to q/ha. Per cent disease control and yield increase was calculated as per standard procedures (Joshi and Tripathi 2002).

The field experiments on evaluation of individual IDM components (botanical, organic and natural farming inputs, bio-agents and fungicides) for the management of anthracnose was conducted as below:

1. Organic and natural inputs: Five organic and natural farming inputs *viz;* panchgavya, jeevamrit, beejamrit, tamarlassi and eupatorium ark were procured from Department of Organic Agriculture and Natural Farming, CSKHPV, Palampur. Procured material was sieved through double layer of muslin cloth and the filtrate obtained was used as 100 per cent stock solution and applied according to their recommended method of application i.e. jeevamrit for soil treatment, beejamrit for seed treatment, panchgavya, eupatorium act and tamarlassi for foliar spray at 10 per cent concentration.The experiment was conducted with six treatments having four replications each in Randomized Block Design. Soil treatment of jeevamrit was done by adding the input in rows before sowing of seed and seed treatment of beejamrit was done by dipping seed in solution for two minutes followed by shade drying for at least 30 minutes before sowing. Three foliar sprays of panchgavya, eupatorium ark and tamarlassi (@10%) were given at ten days interval using knapsack sprayer after filtration.The first spray was given at first appearance of disease along with plots without any seed treatment and sprayed with water were treated as control. Data on disease severity were recorded before each spray for further calculations.

2. Botanicals: Crude extract of five locally available plants i.e. *Melia azedarach* (Darek), *Eucalyptus* sp. (eucalyptus), *Eupatorium odoratum* (Basuti) and *Lantana camera* (lantana) were prepared by dipping fine dried powder of botanical with water in 1:1, overnight. The extract was obtained by filtration of dipped material first with muslin cloth and second time with Whatman no. 1 filter paper. The filtrate thus obtained was used as 100 per cent stock solution (Kaur 2018). The experiment was conducted with five treatments having four replications each in Randomized Block Design. Three foliar sprays of each botanical at 30 per cent concentration were given individually at ten days interval using knapsack sprayer. The first spray was given at first appearance of disease along with plots sprayed with water were treated as control. Data on disease severity were recorded before each spray for further calculations.

3. Bioagents: The efficacy of five bioagents *viz; Trichoderma koningii* (DMA-8), *Trichoderma koningii* (JMA-11), *Trichoderma harzianum* (SMA-5), *Trichoderma harzianum* (TH-11) and *Trichoderma viride* as seed treatment @ 10g/kg seed along with recommended fungicide for seed treatment i.e. carbendazim 50WP @2g/kg seed was evaluated with three replications each in Randomized Block Design. The seeds were thoroughly mixed with culture of each bioagents at the time of sowing individually along with carbendazim 50WP and sown at 30 cm row-to-row spacing. The plots sown without any seed treatment were treated as control. Data on disease severity were recorded before each spray for further calculations.

4. Fungicides: Five fungicides which include one non-systemic (mancozeb 75WP), three systemic (carbendazim 50WP, propiconazole 25EC and tebuconazole 25EC) and one coordinated mixture **(**Trifloxystrobin 25% + tebuconazole 50%) were evaluated for their efficacy against anthracnose in Randomized Block Design. Three sprays of each fungicide were given at 10 days interval using knapsack sprayer. The plots sprayed with water were treated as control. The first spray was given at first appearance of disease. Data on disease severity were recorded before each spray for further calculations.

Results and Discussion

1. Organic and natural farming inputs: The data in table 1 revealed that all five evaluated organic and natural farming inputs significantly reduced the disease severity as compared to check and gave disease control ranging between 20.45 to 33.64 per cent with 9.21 to 26.14 per cent increase in yield over check. Among these inputs, panchgavya was found most effective which gave 33.64 per cent disease control with 26.14

per cent increase in yield followed by eupatorium ark that provided 29.54 per cent disease control and 20.98 and per cent increase in yield. Jeevamrit and tamarlassi were also found moderately effective for the management of disease and gave 26.82 and 22.27 per cent control with 13.40 and 14.31 per cent yield increase, respectively over check. However, seed treatment with beejamrit was found least effective with 20.45 per cent disease control and 9.21 per cent yield increase over control.

Few reports on the management of anthracnose by organic and natural farming inputs are available in literature, Ashlesha and Paul (2014) evaluated panchgavya and fermented buttermilk at 10 per cent concentration against capsicum anthracnose under polyhouse conditions and observed that panchgavya was more effective giving 70.46 per cent disease control than buttermilk (64.39%). Trivedi et al. (2014) evaluated bioefficacy of biodynamic formulation (BD-501) for the management of anthracnose leaf spot in urdbean and observed that it gave 55.45 per cent control with 21.81 per cent yield increase over check.

2. Botanicals: The data on disease severity and yield in table 2 revealed that crude extract of botanicals gave 16.36 to 28.18 per cent disease control with 8.78 to 21.62 per cent yield increase over control. Among these extract of eucalyptus was found most effective which gave 28.18 per cent disease control with 21.62 per cent increase in yield followed by eupatorium ark and lantana which provided 27.27 and 21.82 per cent disease control with 16.22 and 12.84 per cent increase in yield respectively, over check. However, extract of melia was found least effective with 16.36 per cent disease control and 8.78 per cent yield increase over control.

Table 1. Management of urdbean anthracnose caused by *Colletotrichum truncatum* through organic and natural farming management inputs

Treatments	Dose (%)	Disease severity (%)	Control (%)	Yield (q/ha)	Percent yield increase
1. Beejamrit	10	43.75 (41.31)	20.45	8.35	9.21
2. Jeevamrit	10	40.25 (39.34)	26.82	8.67	13.40
3. Panchgavya	10	36.50 (37.09)	33.64	9.65	26.14
4. Eupatorium ark	10	38.75 (38.45)	29.54	9.25	20.98
5. Tamarlassi	10	42.75 (40.80)	22.27	8.74	14.31
6. Control	-	55.00 (47.85)	-	7.65	-
CD (P=0.05)		(3.43)		0.69	

Table 2. Management of urdbean anthracnose caused by *Colleotrichum truncatum* through botanicals

Treatments	Dose (%)	Disease severity (%)	Control (%)	Yield (q/ha)	Percent yield increase
1. Eucalyptus	30	39.50(38.90)	28.18	9.00	21.62
2. Eupatorium	30	40.00(39.18)	27.27	8.60	16.22
3. Lantana	30	43.00(40.93)	21.82	8.35	12.84
4. Melia	30	46.00(42.68)	16.36	8.05	8.78
5. Control	-	55.00(47.85)	-	7.40	-
CD(P=0.05)		(2.79)		0.95	

Many workers also reported the effectiveness of extracts of botanical against anthracnose. Trivedi *et al.* (2014) evaluated neem oil, mustard oil and neem (leaves) against urdbean anthracnose under field conditions as foliar spray and found neem oil as most effective that gave 53.35 per cent disease control with 15.88 per cent increase in yield. Choudhary *et al.* (2017) evaluated extracts *viz*; garlic, neem, ginger, dhatura and mehandi at 10 per cent concentrations under field condition against *C. lindemuthianum* causing anthracnose in green gram and observed that neem provided maximum disease control of 37.31 per cent followed by garlic (28.56%), ginger (23.27%), dhatura (14.07%) and mehandi (7.36%) over check.

3.Bioagents : The data in table 3 revealed that seed treatment with bioagents does not proved effective and gave only 4.88 to 10.98 disease control with 2.79 to 6.04 per cent yield increase over check, however chemical check i.e. seed treatment with carbendazim gave 21.01 per cent disease control with 13.16 per cent increase in yield over check. Among all bioagents, *T. koningii* (JMA-11) gave maximum disease control of 10.98 per cent with 6.04 per cent yield increase over control followed by *T. harzianum* (SMA-5), *T. viride* and *T. harzianum* (TH-11) which provided 7.93, 7.62 and 6.71 per cent disease control with 5.40, 4.65 and 3.71 per cent increase in yield, respectively over check. Whereas, minimum disease control i.e. 4.88 per cent with 2.79 per cent yield increase over control was provided by *T. koningii* (DMA-8).

Similar results were also reported by Choudhary *et al*. (2013) who compared seed treatment of *Trichoderma viride* and *T. harzianum* with carbendazim 50 WP under pot culture against artificially inoculated chilli seeds with *C. capsici* and observed 100 per cent mortality control with carbendazim seed treatment in comparison to 7.14 per cent with *T. harzianum* and 35.24 per cent with *T. viride*.. Gawade *et al.* (2009) evaluated *Trichoderma viride* (100% w/w) and *Verticilium lecanii* (100% w/w) against soyabean anthracnose caused by *C. truncatum* under field conditions and observed that both are less effective under field condition in which *T. viride* and *V. lecanii* only provided 18.87 16.58 per cent disease control, respectively.

4. Fungicides: The data effectiveness of fungicides in the anthracnose management tabulated in table 4 which revealed that these fungicides gave 42.58 to 77.99 per cent disease control with 33.12 to 43.18 per cent yield increase over check. Among these, foliar spray with carbendazim was found most effective which gave 77.99 per cent disease control with 43.18 per cent increase in yield followed by trifloxystrobin 25% + tebuconazole 50% which provided 70.33 per cent disease control and 40.26 per cent increase in yield, over control. Propiconazole 25EC, tebuconazole 25EC and mancozeb 75WP were also found effective for the management of disease, which gave 51.67, 47.37 and 42.58 per cent control and 37.66, 36.69 and 33.12 per cent yield increase over control, respectively. The results showed that all the fungicide were effective against anthracnose of urdbean. The effectiveness of fungicides for the management of anthracnose was also reported by Joshi and Tripathi (2002) observed that seed treatment with carbendazim (0.2%) followed by two prophylactic sprays of carbendazim (0.1%) or tilt (0.1%) at 15 days interval gave maximum reduction in disease severity of urdbean anthracnose and maximum increase in grain yield. Subedi *et al.* (2015) evaluated five fungicides viz; mancozeb 75WP, metalyxl 85 + mancozeb 64WP, carbendazim 50WP, copper

Table 3. Management of urdbean anthracnose caused by *Colleotrichum truncatum* through bioagents

Treatments	Dose (g/kg seed)	Disease severity (%)	Control (%)	Yield (q/ha)	Percent yield increase
1. *T. koningii* (JMA-11)	10	48.67(44.22)	10.98	7.60	6.04
2. *T. harzianum* (TH-11)	10	51.00(45.55)	6.71	7.43	3.71
3.*T. viride*	10	50.50(45.27)	7.62	7.50	4.65
4.*T. koningii* (DMA-8)	10	52.00(46.13)	4.88	7.37	2.79
5.*T.harzianum* (SMA-5)	10	50.33(45.41)	7.93	7.58	5.40
6. Carbendazim 50WP	2	41.33(39.97)	21.01	8.60	13.16
7. Control	-	54.67(47.85)	-	7.17	-
CD (P=0.05)		(3.02)		0.44	

Table 4. Management of urdbean anthracnose caused by *Colleotrichum truncatum* through fungicides

Treatments	Dose (%)	Disease severity (%)	Control (%)	Yield (q/ha)	Percent yield increase
1. Mancozeb 75 WP	0.30	30.00(33.19)	42.58	10.25	33.12
2. Carbendazim 50 WP	0.10	11.50(19.65)	77.99	11.02	43.18
3. Propiconazole 25EC	0.10	25.25(30.14)	51.67	10.60	37.66
4. Tebuconazole 25EC	0.10	27.50(31.58)	47.37	10.52	36.69
5. Trifloxystrobin25%+ tebuconazole 50%	0.10	15.50(23.12)	70.33	10.80	40.26
6. Control	-	52.25(46.71)	-	7.70	-
CD (P=0.05)		(3.10)		0.99	

oxychloride 50 WP and carbendazim 12% + mancozeb 63% under field conditions against soybean anthracnose caused by *C. truncatum* and observed maximum disease control (42.19%) and yield increase (108.69%) with carbendazim 12 %+ mancozeb 63% followed by mancozeb which gave 35.77 per cent control and 81.16 per cent increase in yield.

The present studies revealed that among all IDM component evaluated against urdbean anthracnose fungicides provided significant disease control and yield increase, however sprays of panchgavya (@10%), eupatorium ark (@10%) and extract of eucalyptus (@30%) were also observed effective and can be recommended either solely as an alternative to chemicals or as a part of integration with the chemicals to reduce the number of fungicidal sprays for the management of urdbean anthracnose.

Conflict of interest: There is no conflict of interest among the authors.

References

Anonymous. 2011. Urad: Favorable policies needed to meet rising demand. *The Hindu Business line.* article no. 20357895.

Anonymous. 2018. Annual report 2017-2018 Directorate of Pulse Development, Govt. of India.

Anonymous 2018. e-Pulses data book. *http://www.iipr.res.in/e-pulse-data-book*

Ashlesha and Paul YS. 2014. Antifungal bioefficacy of organic inputs against fungal pathogens of bell pepper. Paripex Indian Journal of Research **3**: 4-6.

Bhardwaj CL and Thakur DR. 1991. Economic management of blackgram (*Phaseolus mungo*) diseases with fungicides. Indian Journal of Agricultural Sciences **61**: 437-439.

Choudhari CS, Jain SC, Kumar R and Choudhary JS. 2013. Efficacy of different fungicides, biocides and botanical extract seed treatment for controlling seed borne Colletotrichum sp. in chilli (*Capsicum annuum* L.). The Bioscan **8**: 00-00.

Choudhary RS, Simon S and Bana SR. 2017. Efficacy of plant extracts against anthracnose (*Colletotrichum lindemuthianum*) of green gram (*Vigna radiata*). International Journal of Chemical Studies **5**: 769-772.

Gawade DB, Suryawanshi AP, Pawar AK, Apet KT and Devgire SS. 2009. Field evaluation of fungicides, botanicals and bioagents against anthracnose of soybean. Agriculture Science Digest **23**: 174-177.

Gupta O, Gurha SN and Trivedi S. 2007. Ecofriendly management of anthracnose disease of urdbean. **In**: Ecofriendly management of Plant Diseases (S Ahmad and U Narain, eds) Daya Publishing House, New Delhi. P.453

Joshi D and Tripathi HS. 2002. Cultural, biological and chemical control of anthracnose of urdbean. Journal of Mycology and Plant Pathology **32**: 52.

Kaur G. 2018. Variability of *Phytophthora nicotianae* var. *parasitica* causing buckeye rot of tomato and its sensitivity to fungicides. MSc Thesis, p.22-36. Department of Plant Pathology, CSKHPKV, Palampur.

Saxena RM and Sinha S. 1977. Seed borne infection of *Vigna mungo* in Uttar Pradesh. Indian Phytopathology **30**: 582-583.

Sharma R. 1996. Studies pathogenic variation in *Colletotrichum truncatum* and resistance in urdbean to the pathogen. MSc Thesis, Department of Plant Pathology, CSKHPKV, Palampur. p 25-51.

Singh RR and Shukla P. 1988. *Colletotrichum* leaf blight of blackgram. Journal of Farm Science **3**: 97-102.

Subedi S, Gharti DB, Neupane S and Ghimire T. 2015. Management of anthracnose I soybean using fungicide. Journal of Nepal Agriculture Research Council**1**:29-32.

Trivedi A, Sharma SK, Ameta OP and Sharma SK. 2014. Management of viral and leaf spot diseases complex in organic farming of black-gram. Indian Phytopathology **67**: 97-101.

Singh AK, Pandey BT, Swarnam VK, Swain TP, Sachchidananda PK, Velmurugan SK, Ahmed Z, Gautam RK and Roy SD. 2016. Technologies for increasing mungbean and urdbean production in Andaman & Nicobar Islands. ICAR-Central Island Agricultural Research Institute Port Blair, India-CARI/TSP-Pulse Bulletin/2015-16/07.