Biological Forum – An International Journal **14(1): 995-997(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Assessment of Herbicidal effect on the Seed Quality of Finger Millet (*Eleusine coracana* (L) Gaertn.)

Amit Kishore, Ajay Kumar*, Arunima Paliwal, Bhim Jyoti, Sumit Chaudhary and Kanchan Harbola
College of Forestry, V.C.S.G. Uttarakhand University of Horticulture and Forestry, Ranichauri, Tehri Garhwal, (Uttarakhand), India.

(Corresponding author: Ajay Kumar)*
(Received 05 November 2021, Accepted 12 January, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: A field experiment was carried out during the *Kharif* season of 2018-19 at Gaja, Research and Extension Centre, College of Forestry, Ranichauri, Tehri Garhwal, Uttarakhand India. As herbicides increase seed yield through managing weeds but seed quality might be adversely affected by the phytotoxicity of the herbicides. Therefore, to assess the herbicidal effect of pre and early post-emergence herbicides on the seed quality of finger millet the study was planned. The experiment was laid out in a completely randomized block design (CRBD) consisting of 11 treatments and 3 replications. The seed quality parameters like the speed of germination, standard germination test, stress test (cold test), and moisture content were recorded. The application of early post-emergence (within 15-20 days) bispyribac sodium 10 SC 15 g a.i./ha with one inter cultivation at 35-40 DAS significantly controls weeds population and density and also significantly increased grain yield of finger millet. However, application of a lower dose of bisyribac sodium 10 SC 10g a.i./ha (within 15-20 days) with one inter cultivation at 35-45 DAS enhance all seed quality parameters viz. first count, speed of germination, germination percent, length of seedling, seedling fresh weight, dry weight of seedling, vigour index I and vigour index II of the seed of finger millet.

Keywords: Finger millet, *Eleusine coracana*, herbicides, seed quality.

INTRODUCTION

Finger millet, commonly known as "Ragi" in India is mainly cultivated in rainfed and tribal areas. The amount of nutrient content in finger millet is higher as compared to other major cereals like wheat, rice, sorghum (Gupta *et al*., 2017; Sharma *et al*., 2017). It contain higher amount of calcium (0.38%), protein (6-13%), dietary fiber (18%), phytates (0.48%), minerals (2.5-3.5%), tannins (0.61%), phenolic compounds (0.3-3%) and trypsin inhibitory factors. It is acknowledged for its beneficial effects such as anti-diarrheal, anti-diabetic, anti-tumorigenic, anti-ulcer with antioxidant and antimicrobial properties, prevent from low oxidation of low-density lipoproteins (LDLs), and also improves gastrointestinal health (Chethan *et al.,* 2007; Devi *et al*., 2014). Therefore, finger millet referred to as nutria-cereal can play important role in strengthening the nutritional security in the developing countries of Asia and Africa (Puranik *et al*., 2017). The initial growth period of finger millet is subjected to heavy weed infestation resulting a higher competition and a drastic reduction in yield (Pradhan *et al.,* 2012; Patil *et al*., 2014). When weeds were managed through herbicides, seed yield would be better but sometimes seed quality might be adversely affected by the phytotoxicity of the herbicides. Sometimes phytotoxicity symptoms might not appear but it might affect the germination capacity of the seed. Very few pieces of literature are available concerning the effect of herbicides on seed quality. Therefore, the study entitled was envisaged.

MATERIALS AND METHODS

The field experiment was conducted during the *Kharif* season of 2018-19 at Gaja, Research and Extension Centre, College of Forestry, VCSG Uttarakhand University of Horticulture and Forestry, Ranichauri, Tehri Garhwal, Uttarakhand, India. The experimental site was laying between 30°16'17"N latitude and longitude of 78° 25'21" E longitudes with an altitude of about 1750m above mean sea level under mid-hill zones of Uttarakhand. The soil of the experimental field was clay loam in texture having pH (5.1), organic carbon (0.65%), available nitrogen (205 kg/ha), low in available phosphorous (20.48 kg/ha), and available potassium 405 kg/ha). The field experiment was laid out in completely randomized block design (CRBD) with 11 treatments (T1-Oxadiargyl 80 WP at 150 g a.i./ha (within 3 DAS) + one IC at 25 to 30 DAS, T2-

Oxadiargyl 80 WP at 200 g a.i./ha (within 3DAS) + one IC at 25 to 30 DAS, T3- Bensulfuron methyl 0.6 G + pretilachlor 6.0 G @ 0.165 kg a.i./ha (within 3 DAS) + one IC at 25 to 30 DAS, T4- Bensulfuron methyl 0.6 G + pretilachlor 6.0 G @ 0.33 kg a.i./ha (within 3 DAS) + one IC at 25 to 30 DAS, T5- Butachlor 50 EC 750 g a.i./ha (within 3 DAS) + one IC at 25 to 30 DAS, T6- Bispyribac sodium 10 SC 10 g a.i./ha (within 15-20 DAS) + one IC at 35 to 40DAS, T7- Bispyribac sodium 10 SC 15 g a.i./ha (within 15 - 20 DAS) + one IC at 35 to 40 DAS, T8- Ethoxysulfuron 15 WG 12 g a.i./ha (within 15 - 20 DAS) + one IC at 35 to 40 DAS, T9- Ethoxysulfuron 15 WG 15g a.i./ha (within 15 - 20 DAS) + one IC at 35 to 40 DAS, T10- One inter-cultivation with one hand weeding at 20 and 40 DAS and T11- Unweeded check) and 3 replications. The laboratory experiments were laid out in complete randomized design (CRD) with 4 replications to estimate the herbicidal effect on seed quality of finger millet. The finger millet variety VL-352 was sown on 11, June 2018 and fertilized with 50 kg N, 40 kg P_2O_5, and 25 kg K_2O. The crop was harvested on 31, Oct 2018. The harvested produced was used to analyzed the effect of herbicides on seed quality of finger millet and the parameters were speed of germination (Maguire, 1962), under standard germination test (first count, germination %, seedlings length, seedlings fresh weight, seedlings dry weight (10 seedlings), vigour index I and II (Abdul-baki and Anderson, 1973), stress test (under cold test all parameter similarly to standard germination test) and moisture % held (ISTA, 1995).

RESULTS AND DISCUSSION

The data on seed yield were illustrated in Table 1. The significantly higher seed yield was registered in bispyribac sodium 10 SC 15g a.i./ha (within 15-20 DAS) + one IC at 35- 40 DAS in comparison to un-weeded check. Bispyribac sodium 10 SC 15g a.i./ha (within 15-20 DAS) + one IC at 35- 40 DAS was statistically on par with oxadiargyl 80 WP at 150g a.i./ha (within 3 DAS) + one IC at 25-30 DAS, bispyribac sodium 10 SC 10g a.i./ha (within 15-20 DAS) + one IC at 35 - 40 DAS, one inter-cultivation with one hand weeding at 20 and 40 DAS, ethoxysulfuron 15 WG 15g a.i./ha (within 15-20 DAS) + one IC at 35- 40 DAS and oxadiargyl 80 WP at 200g a.i./ha (within 3 DAS) + one IC at 25-30 DAS. This was due to minimum competition between crops & weeds and better availability of water, sunlight, nutrients to finger millet at all crop growth stages resulting in higher numbers of tillers and effective tiller per plant leading to higher production of finger millet yield. Similar results were also reported by Kumara *et al*. (2007).

Table 1: Effect of herbicidal treatments on seed yield and quality of finger millet.

Treatments	Seed yield (kg/ha)	Standard Germination Test					Cold Test				Moisture (%)
		First count (%)	Speed of germination	Germination (%)	Vigour index I	Vigour index II	First count (%)	Germination (%)	Vigour index I	Vigour index II	
T1	1746	53.5	10.17	53.5	355.6	1.12	50.5	75.0	607.2	1.56	
T2	1622	51.0	6.50	52.5	339.9	1.02	34.5	67.0	504.8	1.36	12.5
T3	1395	55.5	11.05	58.5	405.7	1.20	63.5	86.0	769.0	1.98	11.4
T4	1512	46.0	9.42	47.5	305.3	0.94	30.5	62.5	447.3	1.27	11.4
T5	1483	41.0	9.39	46.0	297.9	0.89	30.5	59.5	423.4	1.21	11.3
T6	1743	58.0	11.46	62.5	477.4	1.47	73.0	87.5	811.4	1.99	11.3
T7	1857	54.0	10.46	57.0	393.5	1.20	59.5	82.0	687.8	1.68	11.0
T8	1432	53.0	10.17	53.5	355.4	1.06	50.0	73.5	590.5	1.43	11.2
T9	1644	35.5	6.99	42.0	172.1	0.81	26.5	30.0	162.9	0.55	11.5
T10	1693	40.0	8.55	44.0	283.8	0.83	30.0	44.0	303.8	0.81	11.4
T11	1291	29.5	5.54	34.0	97.1	0.61	24.5	27.0	134.6	0.43	10.9
SEm(±)	83	0.82	0.008	0.88	8.10	0.033	0.87	1.07	10.97	0.039	9.8
CD (1%)	245	3.16	0.03	3.40	31.30	0.13	3.36	4.15	42.40	0.15	0.25

The standard germination parameters of finger millet seed were significantly influenced by herbicidal weed management treatments. The standard germination parameters viz. first count, speed of germination, germination percent, seedling length, seedling fresh weight, dry weight of seedling, vigour index I, and vigour index II were significantly higher in bispyribac sodium 10 SC 10g a.i./ha (within 15-20 DAS) + one IC at 35 to 40 DAS comparison to control. Seed quality parameters of standard germination were significantly higher in bispyribac sodium 10 SC 10g a.i./ha (within 15-20 DAS) + one IC at 35 to 40 DAS than one IC with one hand weeding at 20 & 40 DAS. All herbicidal treatments increased seed quality parameters in comparison to control & hand weeding.

Significantly higher seedling fresh weight was recorded in bispyribac sodium 10 SC 10g a.i./ha (within 15-20 DAS) + one IC at 35 to 40 DAS which was at par with bensulfuron methyl 0.6 G + pretilachlor 6.0 G @ 0.165 kg a.i./ha (within 3 DAS) + one IC at 25 to 30 DAS. This was due to lower concentrations of herbicides would not show phytotoxicity and the seed from herbicide-applied plots might get lesser weed competitions and increased uptake of major and minor nutrients which might have been resulted in better growth of crop and development of the seed. Better growth and development of crop leads to the production of good quality seed which resulted in higher germination along with more seedling length and significantly higher seed vigour compared to un-

weeded checks and higher dose of the herbicides. Karaye *et al*. (2014) also reported that the lower dose of butachlor and pendimethalin @ 5mg/ml helpful in increasing seed germination, seedlings with the proper growth of *Vigna sinensis* and Vigna *unguiculata*. Guimaraes *et al*. (2012) also reported that application of paraquat herbicide as desiccant at R6 and R7.2 growth stage of soybean results in higher seed germination and seed vigour than the control. Santos and Vicente (2009) corroborated that pre-harvest utilization of herbicides not reduced germination and yield of the seed.

The significant influence of herbicidal weed management treatments was registered on seed quality under stress conditions (cold test) (Table 1). The germination percentage, vigour index I & II were significantly higher recorded in bispyribac sodium 10 SC 10g a.i./ha (within 15-20 DAS) + one IC at 35 to 40 DAS and at par with bensulfuron methyl 0.6 G + pretilachlor 6.0 G @ 0.165 kg a.i./ha (within 3 DAS) + one IC at 25 to 30 DAS. In seedling dry weight significantly higher recorded in bispyribac sodium 10 SC 10g a.i./ha (within 15-20 DAS) + one IC at 35 to 40 DAS and at par with bensulfuron methyl 0.6 G + pretilachlor 6.0 G @ 0.165 kg a.i./ha (within 3 DAS) + one IC at 25 to 30 DAS, oxadiargyl 80 WP at 150g a.i./ha (within 3 DAS) + one IC at 25 to 30 DAS and bispyribac sodium 10 SC 15g a.i./ha (within 15-20 DAS) + one IC at 35 to 40 DAS. It is might be due to weed management treatments providing less competitive conditions for finger millet which leads to fully matured seed and these seeds were show more vigour under stressed conditions. Improper seed development, stressful growing conditions, and inadequate nutrients affect seed vigour adversely under cold stress conditions. The results were close conformity with the results reported by Vijayakumar and Sundareswaran (2009) under stress test of accelerating aging on ladyfinger.

The lowest seed moisture was recorded in un-weeded check and among the herbicidal treatments lowest moisture percent was recorded in bispyribac sodium 10 SC 10g a.i./ha (within 15-20 DAS) + one IC at 35 to 40 DAS and the highest moisture percent was recorded in oxadiargyl 80 WP at 150 g a.i./ha (within 3 DAS) + one IC at 25 to 30 DAS & butachlor 50 EC 750g a.i./ha (within 3 DAS) + one IC at 25 to 30 DAS (Table 2).

CONCLUSION

The improved seed quality parameters of variety VL-352 of finger millet were recorded with the application of bispyribac sodium 10 SC 10 g a.i. / ha (within 15 - 20 DAS) + one inter cultivation at 35- 40 DAS.

Acknowledgment. The authors thank the ICAR AICRP-Small Millet for financial assistantship and College of Forestry, V.C.S.G. Uttarakhand University of Horticulture and Forestry, Ranichauri, Tehri Garhwal, Uttarakhand for providing the facilities to conduct the experiment.
Conflict of Interest. None.

REFERENCES

Abdul-baki, A. A. and Anderson, J. D. (1973). Vigour determination in soybean seeds by multiple criteria. *Crop Science*, *13*: 630-632.

Chethan, S. and Malleshi, N.G. (2007). Finger millet polyphenols: characterization and their nutraceutical potential. *Annals Journal of Food Technology*, *2*(7): 582-592.

Devi, P. B., Vijayabharathi, Sathyabama, S., Malleshi, N.G. and Priyadarisini, V. B. (2014). Health benefits of finger millet (*Eleusine corcana* L.) polyphenols and dietary fiber. *Journal of food Science Technology*, *51*(6): 1021-1040.

Guimaraes, V. F., Hollmann, M. J., Fioreze, S. L., Echer, M. M., Rodrigues-costa, A. C. P. and Andreotti, M. (2012). Productivity and quality of soybean seeds in function of desiccation stages and herbicides. *Weed plant*, *30*(3): 01-10.

Gupta, S.M., Arora, S., Mirza, N., Pande, A., Lata, C. & Puranik, S. (2017). Finger Millet: a "certain" crop for an "uncertain" future and a solution to food insecurity and hidden hunger under stressful environments. *Frontiers in Plant Science*, *8*: 643.

ISTA. (1995). Handbook of vigour test methods. 1995; 3rd ed. International Seed Testing Association. Zurich. Switzerland.

Karaye, I. U., Aliero, A. A. & Adili, I. S. (2014). Effects of butachlor and pendimethalin herbicides on seed germination and early seedling growth of two species of cowpea. *Annals of Biological Sciences*, *2*(4): 11-15.

Kumara, O., Naik, T.B. & Palaiah, P. (2007). Effect of weed management practices and fertility levels on growth and yield parameters in finger millet. *Karnataka Journal of Agricultural Science*, *20*(2): 230-233.

Maguire, J. D. (1962). Speed of germination and selection and evaluation for seedling emergence and vigour. *Crop Science*, *2*: 176-177.

Patil, B. & Reddy, V. C. (2014). Weed management practices in irrigated organic finger millet (*Eleusine coracana* (L.) Gaertn). *Scholars Journal of Agriculture and Veterinary Sciences*, *1*(4A): 211-215.

Pradhan, A., Rajput, A. S. & Thakur, A. (2012). Effect of weed management practices on finger millet under rainfed conditions. *Indian Journal of Weed Science*, *44*(2): 115–117.

Puranik, S., Kam, J., Sahu, P.P., Yadav, R., Srivastava, R.K. & Ojulong, H. (2017). Harnessing finger millet to combat calcium deficiency in humans: challenges and prospects. *Frontiers in Plant Science*, *8*: 1311.

Santos, P. R. R. & Vicente, D. (2009). Moment physiological plant wheat for drying and their effects on yield. *Cascavel*, *2*(2): 52-62.

Sharma, D., Jamra, G., Singh, U.M., Sood, S. & Kumar, A. (2017). Calcium bio fortification: three pronged molecular approaches for dissecting complex trait of calcium nutrition in finger millet (*Eleusine coracana*) for devising strategies of enrichment of food crops. *Frontiers* in *Plant Science*, *7*: 2028.

Vijayakumar, A. & Sundareswaran, S. (2009). Influence of herbicide application on resultant seed quality in bhendi. *Madras Agriculture of Journal*, *96*(7-12): 337-338.

How to cite this article: Amit Kishore, Ajay Kumar, Arunima Paliwal, Bhim Jyoti, Sumit Chaudhary and Kanchan Harbola Assessment of Herbicidal Effect on the Seed Quality of Finger Millet (*Eleusine coracana* (L) Gaertn.) (2022). *Biological Forum – An International Journal*, *14*(1): 995-997.