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Vikash Meena
Department of Agronomy,
College of Agriculture, Agriculture
University, Jodhpur, Rajasthan,
India

ML Mehriya
Department of Agronomy,
Agriculture University, Jodhpur,
Rajasthan, India

Anuj Kumar
Department of Agronomy,
Agriculture University, Kota,
Rajasthan, India

PR Raiger
Department of Soil Science,
Agriculture University, Jodhpur,
Rajasthan, India

UN Shukla
Department of Agronomy,
Agriculture University, Jodhpur,
Rajasthan, India

Ashok Singh
Programme Assistant Lab
Technician KVK, Jalore-II, AU,
Jodhpur, Rajasthan, India

Shri Krishan Yadav
Department of Soil Science, College
of Agriculture, RVSKVV, Gwalior,
Madhya Pradesh, India

Corresponding Author:
Anuj Kumar
Department of Agronomy,
Agriculture University, Kota,
Rajasthan, India

Efficacy of different herbicides on yield and yield attributes of fenugreek under western Rajasthan

Vikash Meena, ML Mehriya, Anuj Kumar, PR Raiger, UN Shukla, Ashok Singh and Shri Krishan Yadav

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Abstract

A field experiment was conducted to study the effect of different herbicide on yield and yield attributes in fenugreek at experimental field of the Agricultural Research Station Mandor, Jodhpur during *Rabi* season of 2021-22. There were ten treatments combinations of herbicides *viz.* Pendimethalin 1 kg ha⁻¹, PE (T₁), Pendimethalin + Imazethapyr (Ready mix) 800 g ha⁻¹, PE (T₂), Diclosulam 20 g ha⁻¹, PE (T₃), Flumioxazin 100 g ha⁻¹, PE (T₄), Imazethapyr 50 g ha⁻¹(20 DAS) (T₅), Sodium aciflurofan + Clodinafop propargyl (Ready mix) 210 g ha⁻¹(20 DAS) (T₆), Fomesafen + Fluazifop p-butyl 220 g ha⁻¹ 20 DAS (Ready mix) (T₇), Fluazifop p-butyl 250 g ha⁻¹(20 DAS) (T₈), weed free (T₉) and weedy check (T₁₀). Which were laid out in randomized block design with three replications. Among different treatments, application of Pendimethalin + Imazethapyr (Ready mix) 800 g ha⁻¹, PE produce significantly higher seed and straw yield (1652 kg ha⁻¹ and 4041 kg ha⁻¹, respectively) of fenugreek.

Keywords: Fenugreek, herbicides, harvest index, seed weight, yield

Introduction

Fenugreek (*Trigonella foenum-graecum* L.), commonly known as 'Methi' in Hindi, is an annual seed spice crop from the *Fabaceae* family. It is native to regions like eastern Europe and Ethiopia but is extensively cultivated in countries such as India, Argentina, Southern France, Algeria, Morocco, and Lebanon. There are two primary species within the *Trigonella* genus: *T. foenum-graecum* and *T. corniculata*. The former is a semi-erect herb, producing tall, moderately branched plants with bold yellow seeds, while the latter is a bushy plant with medium-sized, scale-shaped pods. Fenugreek typically grows to about two feet in height and features trifoliate leaves. It is highly infested with weeds which drastically reduce the seed yield. Mali and Suwalka (1987) [8] reported that weeds were found hurdle in fenugreek production. Verma *et al.* (2015) reported that weed infestation in fenugreek causes enormous losses (37%). Hand weeding is a common method of weed control adopted by farmers but comparatively this method is costly and time-consuming (Bagri *et al.*, 2014) [1]. The problem becomes more complicated due to the unavailability of sufficient labour during the peak operation period. The chemical method of weed control is used generally in large scale production which reduces labour cost and also a faster method of weed control. Weeds have been identified as an important constraint in realizing the genetic yield potential of this valuable crop through creating biotic stress (Fagaria *et al.*, 2014) [3]. Tripathi and Singh (1994) [14] concluded that weeds in fenugreek give maximum competition for 25-30 days after sowing and as a result seed yield is significantly reduced. Weeds have been identified as a serious drawback in achieving its potential yield. Weeds reduce grain yield of this crop up to an extent of 86% (Tripathi and Singh 2008) [15]. Weeds compete for essential resources and can significantly impact the yield and quality of fenugreek if not managed properly.

Materials and Methods

The experiment was conducted at the experimental field of the Agricultural Research Station in Mandor, Jodhpur (26° 15' N to 26° 45' North latitude and 73° 00' E to 73° 29' East longitude).

The region falls in agro-climatic zone Ia, known as the Arid Western Plains Zone of Rajasthan. The soil of the experimental field was loamy sand in texture, slightly alkaline in nature (pH = 8.2), low in organic carbon (0.13%) and available nitrogen (174 kg ha⁻¹), medium in phosphorus (22.2 kg ha⁻¹) and potassium (325 kg ha⁻¹). The experiment was conducted in randomized block design in three replications with ten treatments combinations of herbicides *viz.* Pendimethalin 1 kg ha⁻¹, PE (T₁), Pendimethalin + Imazethapyr (Ready mix) 800 g ha⁻¹, PE (T₂), Diclosulam 20 g ha⁻¹, PE (T₃), Flumioxazin 100 g ha⁻¹, PE (T₄),

Imazethapyr 50 g ha⁻¹(20 DAS) (T₅), Sodium aciflurofan + Clodinafop propargyl (Ready mix) 210 g ha⁻¹(20 DAS) (T₆), Fomesafen + Fluazifop p-butyl 220 g ha⁻¹ 20 DAS (Ready mix) (T₇), Fluazifop p-butyl, 250 g ha⁻¹(20 DAS) (T₈), weed free (T₉) and weedy check (T₁₀). Observed yield and yield attributes characters *viz.*, Number of pods/plant, Number of seeds/pod, 1000-seed weight (g), Seed yield (kg/ha), Straw yield (kg/ha), Biological yield (kg/ha), Harvest index (%), Number of nodules/plant, Fresh weight of nodules (mg/plant) and Dry weight of nodules (mg/plant).

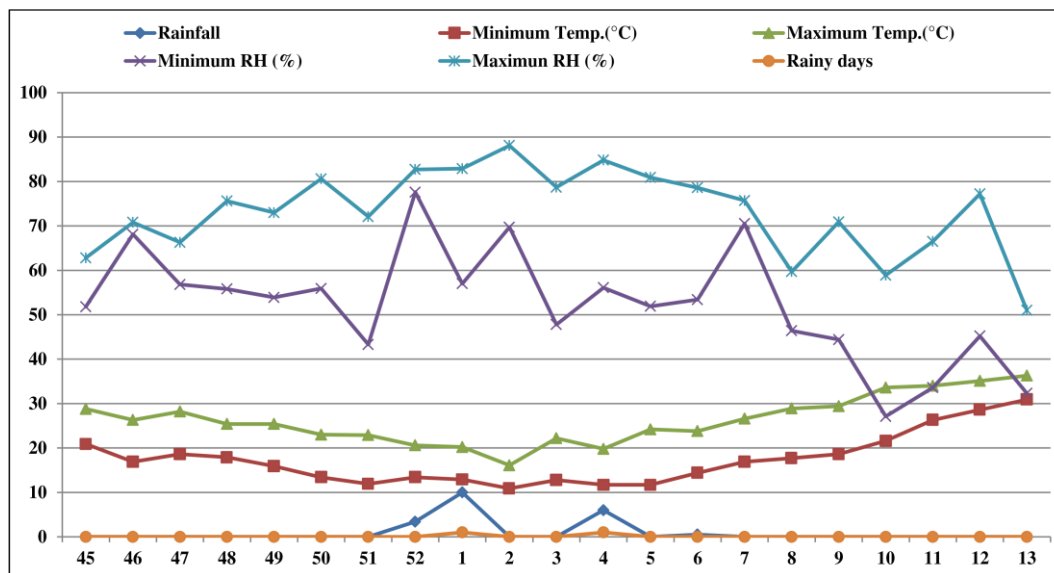


Fig 1: Mean weekly weather parameters for crop season (Rabi, 2021-22)

Results and Discussion

A critical examination of data table 1 that indicated the significantly higher number of pods/plant was recorded under pre emergence of pendimethalin + imazethapyr (Ready mix) 800 g/ha (T₂) treatment while it remained at par with treatment pendimethalin 1 kg/ha, PE (T₁), imazethapyr 50 g/ha (20 DAS) (T₅) and fluazifop p-butyl, 250 g/ha (20 DAS) (T₈). The minimum number of pods/plant was recorded under treatment weedy check. The enhancement in number of pods/plant due to T₂, T₁, T₅ and T₈ were 13.43, 13.01, 12.51 and 8.79 percent, respectively over T₁₀ (weedy check). The highest length of pod of fenugreek was recorded with the application of pendimethalin + imazethapyr (Ready mix) 800 g/ha, PE (T₂) which was found statistically superior over all the other herbicide treatments. Results further revealed that, all the herbicides significantly increased the length of pod of fenugreek in the comparison of weedy check. Among the herbicides treatments, the maximum number of seeds/pod of fenugreek was recorded with the application of pendimethalin + imazethapyr (Ready mix) 800 g/ha, PE (T₂) which was found statistically superior over all the other herbicide treatments except application of pendimethalin 1 kg/ha, PE (T₁), imazethapyr 50 g/ha (20 DAS) (T₅) and fluazifop p-butyl, 250 g/ha (20 DAS) (T₈) which were registered an increase of 14.01, 13.60, 12.69 and 11.36 percent over weedy check. Seed yield of fenugreek was found significantly high in all the herbicidal treatments as compared to weedy check. Among herbicides, pendimethalin + imazethapyr (Ready mix) 800 g/ha, PE (T₂) recorded maximum seed yield which was statistically at par with application of pendimethalin 1 kg/ha, PE (T₁), imazethapyr 50 g/ha (20 DAS) (T₅) and fluazifop p-butyl, 250 g/ha (20 DAS) (T₈). However, the herbicide *i.e.* T₂, T₁, T₅ and T₈ recorded as increase of 74.63, 70.30, 67.02 and 58.77

percent, respectively over weedy check. Among all the treatments, weed free treatment and weedy check treatment recorded the maximum and minimum seed yield of fenugreek, respectively. The significantly higher straw yield of fenugreek was obtained with the application of pendimethalin + imazethapyr (Ready mix) 800 g/ha, PE (T₂) which was statistically at par with application of pendimethalin 1 kg/ha, PE (T₁), imazethapyr 50 g/ha, POE (20 DAS) (T₅) and fluazifop p-butyl, 250 g/ha (20 DAS) (T₈). However, the herbicide *i.e.* T₂, T₁, T₅ and T₈ recorded as increase of 51.24, 48.32, 46.71 and 45.62 percent, respectively over weedy check. The significantly higher biological yield of fenugreek was obtained with the application of pendimethalin + imazethapyr (Ready mix) 800 g/ha, PE (T₂) which was statistically at par with application of pendimethalin 1 kg/ha, PE (T₁), imazethapyr 50 g/ha (20 DAS) (T₅) and fluazifop p-butyl, 250 g/ha (20 DAS) (T₈). However, the herbicide *i.e.* T₂, T₁, T₅ and T₈ recorded as increase of 57.35, 54.06, 52.02 and 49.06 percent, respectively over weedy check. Similar results were reported by Mehta *et al.* (2010)^[10], Sharma (2009)^[13] and Fagaria *et al.* (2014)^[3] in fenugreek.

Among the herbicide treatments, the significantly higher number of nodules/plant was obtained with pendimethalin + imazethapyr (Ready mix) 800 g/ha, PE (T₂) which was closely followed by application of pendimethalin 1 kg/ha, PE (T₁), imazethapyr 50 g/ha (20 DAS) (T₅) and fluazifop p-butyl, 250 g/ha (20 DAS) (T₈). The treatments T₂, T₁, T₅ and T₈ recorded as increase of 14.00, 14.90, 9.59 and 8.75 percent, respectively over weedy check. The maximum fresh weight of nodules/plant was recorded with application of pendimethalin + imazethapyr (Ready mix) 800 g/ha, PE (T₂) which was at par with pendimethalin 1 kg/ha, PE (T₁), imazethapyr 50 g/ha (20 DAS) (T₅) and fluazifop p-butyl, 250 g/ha (20 DAS) (T₈). The

treatment T₂, T₁, T₅ and T₈ increase the fresh weight of nodules of fenugreek registered an increase of 36.93, 36.71, 33.39 and 35.53 percent over weedy check. The maximum dry weight of nodules was recorded with application pendimethalin + imazethapyr (Ready mix) 800 g/ha, PE (T₂) which was significantly superior over rest of the treatments. The treatment registered an increase of 33.73% over weedy check. However, application of T₂ was found at par with T₁, T₅ and T₈. The increase in yield and its attributes might be also due to the

reason that these treatments kept the crop almost weed free up to 30-35 DAS which in turn resulted to significant reduction in competition for nutrients and other growth factors by weeds as a consequence of which reduction in weed dry matter and less competition. These results are in close conformity with the findings of Chaudhary (1999)^[2], Gill *et al.* (2003)^[5], Nandekar *et al.* (2004)^[12], Kumar *et al.* (2005)^[7], Kamboj *et al.* (2005)^[6] and Meena and Mehta (2009)^[9].

Table 1: Effect of different herbicide treatments on Yield, yield attributes of fenugreek

Treatment	Numbers of pods/plant	Length of pod (cm)	Number of seeds/pod	1000-seeds weight (g)	Seed yield (kg/ha)	Straw yield (kg/ha)	Biological yield (kg/ha)	Harvest index (%)	No. of nodules per/plant	Fresh weight of nodules /plant (mg)	Dry weight of nodules/plant (mg)
T ₁ Pendimethalin 1 kg/ha, PE	27.01	13.92	13.70	13.71	1611	3963	5574	28.90	24.10	44.91	21.8
T ₂ Pendimethalin + imazethapyr (Ready mix) 800 g/ha, PE	27.11	13.99	13.75	13.83	1652	4041	5693	29.02	24.29	44.98	22.8
T ₃ Diclosulam 20 g/ha, PE	25.81	13.42	13.34	13.81	1463	3581	5044	29.00	21.65	39.65	19.2
T ₄ Flumioxazin 100 g/ha, PE	25.89	13.44	13.41	13.62	1464	3595	5059	28.94	21.51	39.19	19.5
T ₅ Imazethapyr 50 g/ha, (20 DAS)	26.89	13.39	13.59	13.65	1580	3920	5500	28.73	22.99	43.82	19.0
T ₆ Sodium acifluofan + clodinafop propargyl (Ready mix) 210 g/ha, (20 DAS)	24.00	13.19	12.01	13.51	1080	2915	3995	27.03	21.45	38.16	18.8
T ₇ Fomesafen + fluazifop p-butyl (Ready mix) 220 g/ha, (20 DAS)	24.29	13.22	12.17	13.62	1010	2889	3899	25.90	21.33	38	18.7
T ₈ Fluazifop p-butyl, 250 g/ha, (20 DAS)	26.00	13.50	13.43	13.63	1502	3891	5393	27.85	23.16	44.52	20.1
T ₉ Weed free	27.20	14.32	13.79	13.89	1749	4257	6006	29.12	26.85	49.18	24.3
T ₁₀ Weedy check	23.90	10.58	12.06	13.59	946	2672	3618	26.15	21.14	32.85	16.6
SEm+	0.37	0.17	0.27	0.68	53	143	218	1.15	0.86	1.412	00.7
CD (P=0.05)	1.12	0.51	0.82	NS	156	424	647	NS	2.57	4.193	0.20

Conclusion

Based on one year experimentation it concluded that pre-emergence application of pendimethalin + Imazethapyr (Ready mix) 800 g ha⁻¹, which was followed by Pendimethalin 1 kg ha⁻¹, PE obtained the significantly higher seed yield (1652 kg/ha), straw yield (4041 kg/ha) and biological yield (5693 kg/ha) of fenugreek.

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