E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; 7(1): 19-23
Received: 20-11-2023
Accepted: 30-12-2023

HK Pithiya
Department of Agronomy, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat, India

KI Patel
Associate Research Scientist, Agriculture Research Station, Sardarkrushinagar Dantiwada Agricultural University, Kholvada, Sidhpur, Gujarat, India

JS Desai
Department of Agronomy, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat, India

NA Desai
Department of Agronomy, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat, India

Corresponding Author:
HK Pithiya
Department of Agronomy, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat, India

Weed flora as influenced by different weed control practices in Summer Greengram (*Vigna radiata* L.)

HK Pithiya, KI Patel, JS Desai and NA Desai

DOI: https://doi.org/10.33545/2618060X.2024.v7.i1a.186

Abstract
An experiment was conducted to find out "Weed flora influenced by weed control in Summer Greengram (*Vigna radiata* L.). The soil of experimental field was loamy sand in texture with low in organic carbon and available nitrogen, medium in available phosphorus and potassium and having pH value of 7.45. The predominant weed flora observed in experimental field were *Cynodon dactylon* L., *Digitaria sanguinalis* L. amongst monocot; dicot weeds like *Amaranthus viridis* L., *Alternanthera pungens.*, *Convolvulus arvensis* L., *Vernonia cinerea* L., *Eclipta alba* (L.) Hassk, *Trianthema portulacastrum.*, *Euphorbia hirta* L., *Physalis minima* L. and sedges like *Cyperus rotundus* L. Weed free treatment itself indicate the total eradication of the weeds during entire crop growth period hence it may kept as best and superior one. For any weed parameter comparison it may be superior and excluded in the comparison with other weed control treatments. The weed populations of monocot, dicot and sedge at 30, 60 DAS and at harvest were found minimum under the application of ready mixture of clodinafop propargyl + acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS. Besides weed free situation, significantly lower dry weight of weeds were recorded under ready mixture of clodinafop propargyl + acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS. Among the different weed management treatments, the highest WCE and minimum weed index was observed under the weed free treatment followed by treatment ready mixture of clodinafop propargyl + acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS.

Keywords: Different weed, Summer Greengram, *Vigna radiata* L

Introduction
Pulses are major source of protein among the vegetarians in India and complement the staple cereals in the diets with proteins, essential amino acids, vitamins and minerals. The protein from pulses is easily digestible, restively cheaper and has high biological values. Pulses provide significant nutritional and health benefits and are known to reduce several noncommunicable diseases such as colon cancer and cardiovascular diseases (Yude *et al.*, 1993; Jukanti *et al.*, 2012) [23, 7]. Among the pulses, greengram (*Vigna radiata* L.) is one of the most important and extensively cultivated crop in India, which is cultivated in arid and semi-arid region. Green gram is locally known as "Mug, Moong, Mungo or Golden gram". It originated from Indo-Burma and area of south East Asia. Its food value is essentially due to its high protein content about 25%, 1.3% fat, 3.5% mineral, 4.1% fiber and 56.7% carbohydrate. The grains are mainly used as dal or to make flour and green pods used as vegetables. In India mung beans are also consumed as a snack, called "Dal mung". The dried mung beans are socked in water, then partly dried to a dry matter content of about 42%, and then fried in hot oil. Traditionally it prepared at home and now a day, it is available from industrial producers. The germinated greengram seed containing Vitamin-C and easily digestible protein which is ideally useful in the diet of infants. In spite of the importance of this crop in our daily diet average productivity of this crop is very low in India as well as in the Gujarat. The low production of this crop is mainly due to crop-weed competition and other reasons.
Weed management is an important key factor for enhancing the productivity of green gram, as weeds compete for nutrient, water, light and space with crop plants during early growth period. Moreover, besides low yield of crop, it increases cost of production, harbor insect-pest and diseases, deteriorating quality of farm produce and reduce land value of the different factors

known for reduction in crop production, among them weed stand first (Subramanian *et al.*, 1993) [17]. Weed infestation is one of the major constraints in greengram cultivation. In view of severe infestation of annual and perennial weeds in summer greengram, the potential yield is generally not realized. The available pre and post-emergence herbicide, Pendimethalin, imazathapyr, and imazathapyr + quizalofop-ethyl are able to check the emergence and growth of annual grasses and broadleaved weeds. The major weed species during the summer season *Echinocola colonum* L, *Physalis minima* L, *portulaca quadrifida* L, *Dactyloctenium aegyptium* L, *Trianthema portulacastrum* L, *Euphorbia hirta* L, *Phylanthus niruri* L, *Amaranthus viridis* L, *Celosia argentena* L, *Digitaria longiflora* L, *Commelina benghalensis* L and *cyperus rotundus* L etc. are the major weed species. Weed infestation is one of the major constraints in greengram cultivation. In view of severe infestation of annual and perennial weeds in summer greengram, the potential yield is generally not realized. The available pre and post-emergence herbicide, Pendimethalin, imazathapyr, and imazathapyr + quizalofop-ethyl are able to check the emergence and growth of annual grasses and broadleaved weeds. In present days we are using majority of single herbicide molecules which is control limited weed flora. But the recent trend to use different two or more herbicides mixture either tank mix or ready mix at the time of application. No single herbicide will be capable to destroy all type of weeds without crop injury because of higher dose requirements for increasing the spectrum of weeds kill. These combinations of herbicides result into wide spectra to control of weeds.

Materials and methods

The present investigation was carried on "Weed control in summer greengram (*Vigna radiata* L.)" with herbicides, its combination and cultural practices during summer season 2020 at Agronomy Instructional Farm, C. P. College of agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. The topography of the experimental field area was fairly uniform and leveled. The soil of the experimental field was loamy sand in textural class, low in organic carbon and available nitrogen, medium in available phosphorus and potassium. Summer greengram variety "GM 6" was sown on March 3, 2020 with a spacing of 45 cm × 10 cm. The recommended dose of fertilizers at the rate of 20-40-00 kg of N-P2O5-K2O/ha in the form of urea, single super phosphate was applied to all treatments. The experiment was laid out in randomized block design with three replications and the treatments comprised ten weed control treatments *viz.*, Pendimethalin 1.0 kg/ha as PE (T_1), Imazethapyr 50 g a.i./ha at PoE at 25 DAS (T_2), ready mixture of Pendimethalin + Imazethapyr 800 g a.i./ha PE (T_3), ready mixture of Imazethapyr + Imazamox 70 g a.i./ha PoE at 25 DAS (T_4), tank mixture of Imazethapyr 30 g a.i./ha + Quizalofop-p-ethyl 15 g a.i./ha as PoE at 25 DAS (T_5), ready mixture of Clodinafop Propargyl + Acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS (T_6), tank mixture of Fomesafen 220 g a.i./ha + Fluazifop-p-ethyl 220 g a.i./ha as PoE at 25 DAS (T_7), hand weeding at 25 DAS and 40 DAS (T_8), weedy check (T_9) and weed free (T_{10}). Pre emergence herbicides application was done second day after 1st irrigation and post emergence at 25 DAS using knapsack sprayer fitted with flat fan nozzle by mixing in 500 litre of water/ha as per treatment. The weather conditions were favorable for crop growth and development of the crop. No severe incidence of any disease and pest was observed during the course of investigation. Weed density and weed dry matter per m^2 was recorded with the help of 0.5 x 0.5 m^2 quadrant at harvest. In order to draw a valid conclusion, the data of weed density and weed dry matter were subjected to square root transformation ($\sqrt{x}$ + 0.5) as suggested by Gomez and Gomez (1984) before statistical analysis. Weed Index (%) and Weed Control Efficiency (%) were worked out as per the formula suggested by Gill and Kumar (1969) [4] and Kondap and Upadhyay (1985) [9], respectively.

Results and Discussion

Different weed management practices significantly influenced on weed density and dry weight of weeds. Weed free treatment (T_{10}) was considered as totally weed free during entire crop growth period. Hence, it may not be compared but it was considered as a effective weed control treatment. The weed populations of monocot (2.58, 3.32 and 3.67 no./m2 at 30, 60 DAS and at harvest, respectively), dicot (3.01, 3.47 and 3.96 no./m2 at 30, 60 DAS and at harvest, respectively) and sedge (2.13, 2.85 and 3.13 no./m2 at 30, 60 DAS and at harvest, respectively) were found minimum under the application of ready mixture of Clodinafop Propargyl + Acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS (T_9). It might be due to timely removal of weeds in weed free by manual weeding and effective control of weeds by integration of herbicides are responsible for lower weed intensity under the above mentioned treatments. Further, dense crop canopy under these treatments had suppressing effect on weeds. This study was also reported by Devi (2012) [2], Upadhyay *et al.* (2012) [20], Patel *et al.* (2014) [12] and Rajib *et al.* (2014) [14]. The remarkable reduction in weed population at different stages might be due to effective weed control in respective treatments either manual or herbicidal control or both. These findings are coinciding with the results of Jajoria *et al.* (2014) [6] and Verma *et al.* (2017) [21].

Different weed management practices significantly influenced on dry weight of weeds. Application of ready mixture of Clodinafop Propargyl + Acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS (T_6) significantly reduced the dry weight of weeds (32.58 g/m2) over weedy check (T_9). However, it was at par with hand weeding at 25 DAS and 40 DAS (T_8: 47.93 g/m^2). The lower dry matter in these treatments might be due to better efficacy and prolonged effectiveness of applied herbicides and hand weeding which reduced weed growth and hence, resulted in rapid depletion of carbohydrate synthesis of weeds, already germinated has rapid respiration, bleaching of chlorophyll pigment, reduction in leaf area and diminution of photosynthesis process. Hand weeding, pre-emergence and post emergence application herbicides at initial and early crop growth stage, which resulted into the lowest weed counts and finally reduced the dry weight of weeds at harvest, ultimately the rapid growth of greengram crop, dense crop canopy might be suppressed weed growth as indicated by plant height and more number of branches per plant, which did not allow weeds to grow vigorously due to smothering effect. These findings are in agreement with the findings of Ali *et al.* (2011) [1], Tamang *et al.* (2015) [19], Dinesh *et al.* (2016) [3], Patel *et al.* (2016) [11], Singh *et al.* (2017) [15], Yadav *et al.* (2018) [22], Singh *et al.* (2019) [16] and Mahajan *et al.* (2020) [10].

The WCE considered 100 percent under the weed free treatment (T_{10}) by keeping weed free up to harvest of the crop. The highest WCE (84.49%) was recorded under the treatment ready mixture of Clodinafop Propargyl + Acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS (T_6) followed by hand weeding at 25 DAS and 40 DAS (T_8: 77.19%), tank mixture of Imazethapyr 30 g/ha + Quizalofop-p-ethyl 15 g a.i./ha as PoE at 25 DAS (T_5: 74.90%), tank mixture of Fomesafen 220 g a.i./ha + Fluazifop-p-ethyl 220

g a.i./ha as PoE at 25 DAS (T_7: 72.19%) and ready mixture of Pendimethalin + Imazethapyr 800 g a.i./ha PE (T_3: 71.55%). The higher weed control efficiency recorded under weed free treatment (T10) might be due to periodical removal of weeds by hand weeding or herbicidal effects resulted in remarkable reduction in weed population and ultimately less dry weight of weeds. Similar results have been found by Devi (2012) [2], Raj *et al*. (2012), Upadhyay *et al.* (2012), Sultan and Baigh (2013), Rajib *et al.* (2014) [14], Harithavardhini *et al.* (2015) [5], Komal *et al*. (2015) [8], Dinesh *et al*. (2016) [3] and Singh *et al.* (2017) [15]. The weed free (T_{10}) itself having the lowest weed index, that's why it was excluded from the comparison with other weed control treatments. Besides this, the lowest weed index was found under treatment of ready mixture of Clodinafop Propargyl + Acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS (T_6: 11.74%), followed by hand weeding at 25 DAS and 40 DAS (T_8: 12.53%) and tank mixture of Imazethapyr 30 g a.i./ha + Quizalofop-p-ethyl 15 g a.i./ha as PoE at 25 DAS (T_5: 21.44%). This might be due to the broad spectrum control of weeds achieved by using the application of ready mixture of Clodinafop Propargyl + Acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS (T_6). Weed index worked out at harvest of crop was found lowest under weed free condition (T_{10}). These results are in accordance with the results indicated by Komal *et al*. (2015) [8], Dinesh *et al*. (2016) [3] and Singh *et al.* (2017) [15].

Conclusions

From the experimental results it can concluded that the summer greengram crop keep weed free for better yield and net realization but under paucity of labours, apply ready mixture of Clodinafop propargyl + Acifluorfen sodium 250 g a.i./ha as Post emergence at 25 DAS for effective control of weed flora.

Table 1: Major weed flora recorded during the crop growth period

Sr. No.	Family	Botanical name	English name	Local name
[A]	**Monocot weeds**			
1.	Gramineae	*Cynodon dactylon* (Linn.) Pers	Bermuda Grass	Doob Grass
2.	Gramineae	*Digitaria Sanguinalist* (L.) Scop	Crab grass	Arotaro
[B]	**Dicot weeds**			
1.	Amaranthaceae	*Amaranthus viridis* L.	Pig weed	Tandaljo
2.	Amaranthaceae	*Digera arvensis* Forsk.	Amaranthus	Kanjaro
3.	Amaranthaceae	*Alternanthera pungens*	Khakhi weed	Sata
4.	Convolvulaceae	*Convolvulus arvensis* L.	Field bind weed	Hiaran, Khuri
5.	Compositae	*Vernonia cinerea* Less	Phulni	Fulakia
6.	Compositae	*Eclipta alba* (L.) Hassk	False daisy	Bhangra
	Aizoceae	*Trianthema portulacastrum*	Carpet weed	Satodi
8.	Euphorbiaceae	*Euphorbia hirta* L.	Spurge	Dudheli
9.	Solanaceae	*Physalis minima* L.	Ground cherry	Popti
[C]	**Sedge**			
1.	Cyperaceae	*Cyperus rotundus* L.	Nut sedge	Chidho

Table 2: Monocoat weed population as influenced by different weed control treatments in summer greengram

	Treatments	Monocoat weed population (No./m^2)		
		At 30 DAS	At 60 DAS	At harvest
T_1	Pendimethalin 1.0 kg a.i./ha as PE	3.48	4.25	4.44
		(11.65)	(17.59)	(19.22)
T_2	Imazethapyr 50 g a.i./ha at PoE at 25	3.93	4.59	4.81
	DAS	(14.98)	(20.60)	(22.60)
T_3	Ready mixture of Pendimethalin +	2.79	4.22	4.41
	Imazethapyr 800 g a.i./ha PE	(7.31)	(17.30)	(18.95)
T_4	Ready mixture of Imazethapyr +	3.88	4.56	4.70
	Imazamox 70 g a.i./ha PoE at 25 DAS	(14.65)	(20.29)	(21.59)
T_5	Tank mixture of Imazethapyr 30 g a.i./ha + Quizalofop-p-ethyl 15 g a.i./ha as PoE at 25 DAS	3.18 (9.65)	3.80 (13.96)	4.13 (16.58)
T_6	Ready mixture of Clodinafop Propargyl + Acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS	2.58 (11.31)	3.32 (10.55)	3.67 (12.94)
T_7	Tank mixture Fomesafen 220 g a.i./ha+ Fluazifop p butyl at 220 g a.i./ha as PoE at 25 DAS	3.33 (10.65)	4.06 (15.96)	4.25 (17.59)
T_8	Hand weeding at 25 DAS and 40 DAS	3.13	3.71	4.06
		(9.31)	(13.29)	(15.95)
T_9	Weedy check	6.33	7.24	7.29
		(39.62)	(51.97)	(52.62)
T_{10}	Weed free	-	-	-
	S.Em.±	0.07	0.12	0.12
	C.D. at 5%	0.28	0.36	0.35
	C.V. %	3.7	5.2	4.8

Note: Figure in the parenthesis refers to original value and outside the parenthesis indicates transformed ($(\sqrt{X+0.5})$ value.

Table 3: Dicot weed population as influenced by different weed control treatments in summer greengram

	Treatments	Dicot weed population (No./m^2)		
		At 30 DAS	At 60 DAS	At harvest
T_1	Pendimethalin 1.0 kg a.i./ha as PE	4.45	4.66	5.11
		(19.28)	(21.26)	(25.60)
T_2	Imazethapyr 50 g a.i./ha at PoE at 25	4.50	4.87	5.24

	DAS	(19.71)	(23.26)	(26.91)
T_3	Ready mixture of Pendimethalin +	4.10	4.63	5.01
	Imazethapyr 800 g a.i./ha PE	(16.28)	(20.94)	(24.59)
T_4	Ready mixture of Imazethapyr +	4.48	4.70	5.14
	Imazamox 70 g a.i./ha PoE at 25 DAS	(19.60)	(21.57)	(25.91)
T_5	Tank mixture of Imazethapyr 30 g a.i./ha + Quizalofop-p-ethyl 15 g a.i./ha as PoE at 25 DAS	3.53 (11.94)	4.01 (15.55)	4.37 (18.58)
T_6	Ready mixture of Clodinafop Propargyl + Acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS	3.01 (8.55)	3.47 (11.52)	3.96 (15.20)
T_7	Tank mixture Fomesafen 220 g a.i./ha+ Fluazifop p butyl at 220 g a.i./ha as PoE at 25 DAS	4.01 (15.56)	4.59 (20.57)	4.84 (22.94)
T_8	Hand weeding at 25 DAS and 40 DAS	3.32	3.88	4.33
		(10.52)	(14.54)	(18.22)
T_9	Weedy check	7.33	8.11	8.19
		(53.29)	(65.28)	(66.62)
T_{10}	Weed free	-	-	-
	S.Em. ±	0.13	0.15	0.14
	C.D. at 5%	0.39	0.43	0.44
	C.V. %	5.8	5.8	5.5

Note: Figure in the parenthesis refers to original value and outside the parenthesis indicates transformed ((√X+0.5) value.

Table 4: Sedge weed population as influenced by different weed control treatments in summer greengram

	Treatments	**Sedge weed population (No./m^2)**		
		At 30 DAS	**At 60 DAS**	**At harvest**
T_1	Pendimethalin 1.0 kg a.i./ha as PE	2.80	3.49	3.76
		(7.36)	(11.65)	(13.65)
T_2	Imazethapyr 50 g a.i./ha at PoE at	2.92	3.53	3.89
	25 DAS	(8.03)	(12.00)	(14.65)
T_3	Ready mixture of Pendimethalin +	2.74	3.39	3.63
	Imazethapyr 800 g a.i./ha PE	(7.03)	(11.00)	(12.65)
T_4	Ready mixture of Imazethapyr +	2.86	3.44	3.81
	Imazamox 70 g a.i./ha PoE at 25 DAS	(7.69)	(11.34)	(13.99)
T_5	Tank mixture of Imazethapyr 30 g a.i./ha + Quizalofop-p-ethyl 15 g a.i./ha as PoE at 25 DAS	2.62 (6.36)	3.24 (9.99)	3.44 (11.33)
T_6	Ready mixture of Clodinafop Propargyl + Acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS	2.13 (4.03)	2.85 (7.63)	3.13 (9.33)
T_7	Tank mixture Fomesafen 220 g a.i./ha+ Fluazifop p butyl at 220 g a.i./ha as PoE at 25 DAS	2.68 (6.68)	3.29 (10.34)	3.53 (11.99)
T_8	Hand weeding at 25 DAS and 40 DAS	2.49	3.13	3.34
		(5.68)	(9.33)	(10.65)
T_9	Weedy check	3.12	3.85	3.93
		(9.24)	(14.33)	(15.00)
T_{10}	Weed free	-	-	-
	S.Em.±	0.06	0.08	0.08
	C.D. at 5%	0.17	0.23	0.22
	C.V. %	3.9	4.3	4.0

Note: Figure in the parenthesis refers to original value and outside the parenthesis indicates transformed ((√X+0.5) value.

Table 5: Dry weight of weeds at harvest as influenced by different weed control treatments in summer greengram

Treatments		**Dry weight of weed (g/m^2)**
T_1	Pendimethalin 1.0 kg a.i./ha as PE	63.66
T_2	Imazethapyr 50 g a.i./ha at PoE at 25 DAS	67.46
T_3	Ready mixture of Pendimethalin + Imazethapyr 800 g a.i./ha PE	59.78
T_4	Ready mixture of Imazethapyr + Imazamox 70 g a.i./ha PoE at 25 DAS	66.06
T_5	Tank mixture of Imazethapyr 30 g a.i./ha + Quizalofop-p-ethyl 15 g a.i./ha as PoE at 25 DAS	52.74
T_6	Ready mixture of Clodinafop Propargyl + Acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS	32.58
T_7	Tank mixture Fomesafen 220 g a.i./ha+ Fluazifop p butyl at 220 g a.i./ha as PoE at 25 DAS	58.44
T_8	Hand weeding at 25 DAS and 40 DAS	47.93
T_9	Weedy chseck	210.16
T_{10}	Weed free	-
S. Em. ±		6.11
C.D. at 5%		18.16
C.V. %		16.08

Table 6: WCE and WI as influenced by different weed control treatments in summer greengram

	Treatments	**Weed control efficiency (%)**	**Weed index (%)**
T_1	Pendimethalin 1.0 kg a.i./ha as PE	69.70	26.90
T_2	Imazethapyr 50 g a.i./ha at PoE at 25 DAS	67.89	29.11
T_3	Ready mixture of Pendimethalin + Imazethapyr 800 g a.i./ha PE	71.55	23.62
T_4	Ready mixture of Imazethapyr + Imazamox 70 g a.i./ha PoE at 25 DAS	68.56	27.31
T_5	Tank mixture of Imazethapyr 30 g a.i./ha + Quizalofop-p-ethyl 15 g a.i./ha as PoE at 25 DAS	74.90	21.44
T_6	Ready mixture of Clodinafop Propargyl + Acifluorfen sodium 250 g a.i./ha as PoE at 25 DAS	84.49	11.74
T_7	Tank mixture Fomesafen 220 g a.i./ha+ Fluazifop p butyl at 220 g a.i./ha as PoE at 25 DAS	72.19	22.64

T_8	Hand weeding at 25 DAS and 40 DAS	77.19	12.53
T_9	Weedy check	0.00	35.21
T_{10}	Weed free	100.00	0.00

References

1. Ali S, Patel JC, Desai LJ, Singh J. Effect of herbicides on weeds and yield of rainy season greengram. Legume Research. 2011;34(4):300-303.
2. Devi G. Studies on the effect of herbicides on the growth and yield of soybean [PG Thesis]. Acharya N G Ranga Agriculture University, Hyderabad, India; 2012.
3. Dinesh J, Rajvir S, Seema S. Weed biomass and yield of green gram (*Vigna radiata*) as affected by sequential application of herbicides in Indo-Gangetic Plains. Indian Journal of Agricultural Sciences. 2016;86(3):18-22.
4. Gill GS, Kumar V. Weed index a new method for reporting weed control trials. Indian Journal of Agronomy. 1969;16(2):96-98.
5. Harithavardhini J, Jayalalitha K, Ashoka Rani Y, Krishnaveni B. Efficacy of post-emergence herbicides on weed control efficiency, partitioning of dry matter and yield of *blackgram* (*Vigna mungo* L.). International Journal of Food, Agriculture and Veterinary Sciences. 2015;6(2):39-44.
6. Jajoria DK, Narolia GP, Massey JX, Singh H. Bio-efficacy of fenoxaprop-p-ethyl 9 EC for grassy weed control in groundnut (*Arachis hypogaea*). International Journal of Plant Sciences. 2014;9(1):266-270.
7. Jukanti AK, Gaur PM, Gowda CL, Chibbar RN. National quality and health benefits of *chickpea* (*Cicer arietinum* L.). British Journal of Nutrition. 2012;10:11-26.
8. Komal SP Singh, Yadav RS. Effect of weed management on growth, yield and nutrient uptake of greengram (*Vigna radiata* L.). Indian Journal of Weed Science. 2015;47(2):206-210.
9. Kondap S, Upadhyay UC. A practical manual on weed control. Oxford and IBH Publishing Company; c1985.
10. Mahajan A, Kumar, Puniya RA, Stanzen L. Pre- and post-emergence herbicides effect on weed dynamics, microbial population and yield of summer blackgram. Indian Journal of Weed Science. 2020;52(4):340-345.
11. Patel BD, Chaudhari DD, Patel VJ, Patel RB. Pre & post emergence herbicides in weed control in green gram and their residual effect on succeeding crops. Indian Journal of Weed Science. 2016;48(1):40-43.
12. Patel RB, Patel BD, Parmar JK. Combination of Imazethapyr with other herbicides against complex weed flora in *black gram*. In: Extended Summary of Biennial Conference of Indian Society of Weed Science, DSWR, Jabalpur (M.P.); c2014. p. 115.
13. Raj VC, Patel DD, Thanki JD, Aravadia MK. Effect of integrated weed management on weed control and productivity of greengram (*Vigna radiata* L.). Bioinnfolet. 2012;9(3):392-396.
14. Rajib D, Patra BC, Mandal MK, Pathak A. Integrated weed management in blackgram (*Vigna mungo* L.) and its effect on soil microflora under sandy loam soil of West Bengal. The Bioscan. 2014;9(4):1593-1596.
15. Singh G, Virk HK, Sharma P. Efficacy of pre and post management herbicides for weed control in green gram. Indian Journal of Weed Science. 2017;49(3):252-255.
16. Singh G, Virk HK, Veena K. Pre and post–emergence herbicides effect on growth, nodulation and productivity of green gram. Indian Journal of Weed Science. 2019;51(3):257-261.
17. Subramanian S, Mohamed A, Jayakumar R. All about weed control. Kalyani pub., New Delhi; c1993. p. 1-5.
18. Sultan T, Baigh MA. Weed control in summer mungbean. Environmental and Ecology. 2013;31(2A):775-777.
19. Tamang D, Nath R, Sengupta K. Effect of herbicide application on weed management in green gram (*Vigna radiata* L.). Crop Science Technology. 2015;3(2):1-4.
20. Upadhyay VB, Bharti V, Rawat A. Bioefficacy of post-emergence herbicides in soybean. Indian Journal of Weed Science. 2012;44(4):261-263.
21. Verma SK, Prasad SK, Kumar S, Singh SB, Singh RP, Singh YV. Effect of mulching and herbicides on weeds, yield and economics of greengram (*Vigna radiata* L.) grown under eight-year old agri-hortisystem. Research on Crops. 2017;18:438-443.
22. Yadav R, Kumar S, Dhaka AK, Kumar N. Effect of planting method and weed management practice on yield of *green gram*, weed dynamics visa vis phytotoxicity in green gram. Indian Journals of Agriculture and Research. 2018;14(1):158-164.
23. Yude C, Kaiwei H, Fuji L, Jie Y. The potential and utilization prospects of kinds of wood fodder resources in Yunnan. Forestry Research. 1993;6:646-650.