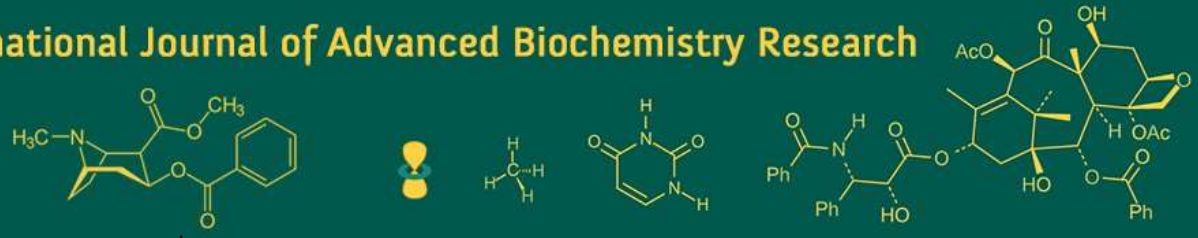
International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(6): 115-119
www.biochemjournal.com
Received: 15-03-2024
Accepted: 19-04-2024

Ankur Tripathi
Research Scholar, Department of Agronomy, Acharya Narendra Dev University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Anil Kumar Singh
Professor and Head, Department of Agronomy, Acharya Narendra Dev University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Satya Prakash Gupta
Research Scholar, Department of Agronomy, Acharya Narendra Dev University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Shweta Gupta
Research Scholar, Department of Agronomy, Banda University of Agriculture and Technology, Banda, Uttar Pradesh, India

Hariom Mishra
Subject Matter Specialist Agronomy, Acharya Narendra Dev University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Manoj Kumar Tripathi
Principal Scientist, ICAR-IISR, Lucknow, Uttar Pradesh, India

Corresponding Author:
Ankur Tripathi
Research Scholar, Department of Agronomy, Acharya Narendra Dev University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

To find out the effect of crop residue management and weed management practices on growth parameters of wheat (*Triticum aestivum* L)

Ankur Tripathi, Anil Kumar Singh, Satya Prakash Gupta, Shweta Gupta, Hariom Mishra and Manoj Kumar Tripathi

DOI: https://doi.org/10.33545/26174693.2024.v8.i6b.1272

Abstract
The field experiment was conducted at Agronomy Research Farm, Acharya Narendra Deva University of Agriculture & Technology in Kumarganj, Ayodhya (U.P.) during the course of two consecutive Rabi seasons in 2021–22 and 2022–23. The treatment combinations of 4 crop residue management, *viz.* conventional tillage without residue, conventional tillage with residue (3 t/ha rice residue), zero tillage without residue, zero tillage with residue (3 t/ha rice residue) and 5 weed management practices, *viz.* Triallate 50% EC @ 1250 gm a.i. ha^{-1}, Triallate 50% EC @ 2500 gm a.i. ha^{-1}, Clodinafop propargyl 15% + Metsulfuron methyl 1% (60 gm + 4 gm a.i. ha^{-1}), hand weeding at 20 and 40 DAS and weedy check in wheat were tested with 3 replications in split-plot design, keeping crop residue management in main plots and weed management practices in subplots. Out of the various crop residue management techniques, wheat crop growth characteristics were significantly impacted by zero tillage with residue in both years, and then by conventional tillage with residue. While that in case of weed management practices, hand weeding at 20 and 40 DAS had significant influence on crop growth parameters of wheat during both the years closely followed by Clodinafop Propargyl 15% + Metsulfuron Methyl 1% WP PoE (60 gm + 4 gm a.i. /ha).

Keywords: Crop residue management, weed management practices, growth parameters, *Triticum aestivum* L

Introduction
The world's most significant crop for staple food cereals is wheat (*Triticum aestivum* L.). After rice, it is India's second-most important cereal crop. The backbone of India's food security is the rice-wheat farming system.

As a result, the Indo-Gangetic Plains (IGP) saw the rise of the rice-wheat farming system, which paved the way for the Green Revolution. Weeds are one of the major production variables that threaten wheat productivity. Weeds compete with crops for water, nutrients and other growth factors (Khokhar and Nepalia, 2010, and Singh *et al*., 2019) [4, 13] and remove considerable quantity of applied nutrients and water in absence of an effective control measures resulting greater loss in yield (Singh *et al*., 2017) [12]. For realizing potential crop yield, proper weed management is essential (Punia *et al*., 2017) [10]. Because wheat is produced in a variety of agro-climatic situations with varying cropping sequences, tillage practices, and irrigation schedules, it is plagued with a wide range of weed flora. Herbicides and tillage both significantly alter the kind of weed flora. The crop is infested with heavy population of grassy and broad leaf weeds *viz*., *Phalaris minor*, *Paspalum monospeliensis*, *Avena ludoviciana*, *Avena fetua*, *Poa annua*, *Cyperus rotundus*, *Cynodon dactylon*, *Chenopodium album*, *Chenopodium murale*, *Spergula arvensis*, *Vicia* sp., *Desmodium trifoloium*, *Anagallis arvensis*, *Rumex dentatus*, *Coronopus didymus*, *Convolvulus arvensis*, *Melilotus alba*, *Euphorbia* sp., *Solanum nigrum*, *Physalis minima* and *Lathyrus aphaca* (Singh *et al*., 2017) [12]. This demonstrated the necessity of implementing weed control strategies in addition to various crop residue management techniques. When compared to wheat planted in conventional tillage, the amount of dry biomass from weeds per unit area was considerably lower under conservation tillage.

This results in better germination of seeds along with the increase in plant height, number of tillers, leaf area index and dry matter accumulation of wheat crop. Among the conservation tillage methods, zero tillage with residue resulted in better germination along with significant increase in all the growth parameters.

Materials and Methods

The field experiment was conducted at the Acharya Narendra Deva University of Agriculture & Technology's Agronomy Research Farm in Kumarganj, Ayodhya (U.P.) during the course of two consecutive Rabi seasons in 2021–22 and 2022–23. The experimental plot was assigned in fairly uniform topography and well-drained soil which had homogenous fertility and textural arrangement. In general, the deep, level, well-drained alluvial soils of the Indo-Gangetic plains (IGP) have low available nitrogen and medium levels of accessible phosphate and potassium. The treatment combinations of 4 crop residue management, *viz.* conventional tillage without residue, conventional tillage with residue (3 t/ha rice residue), zero tillage without residue, zero tillage with residue (3 t/ha rice residue) and 5 weed management practices, *viz.* Triallate 50% EC @ 1250 gm a.i. ha^{-1}, Triallate 50% EC @ 2500 gm a.i. ha^{-1}, Clodinafop propargyl 15% + Metsulfuron methyl 1% (60 gm + 4 gm a.i. ha^{-1}), hand weeding at 20 and 40 DAS and weedy check in wheat were tested with 3 replications in split-plot design, keeping crop residue management in main plots and weed management practices in subplots on a fixed site. Treatment combinations were assigned to experimental units randomly employing Fisher and Yates random table method (Panse and Sukhatme, 1985) [8]. Sowing was done in rows 20 cm apart by respective seed drills as per treatment. Wheat variety HD-2967 was sown on 21/11/2021 and 22/11/2022 and field was fertilized with N: P_2O_5: K_2O @ 120:60:40 Kg ha^{-1} in the form of urea, di-ammonium phosphate and muriate of potash, respectively. Initial plant population of each treatment were taken at 15 DAS randomly from three locations with quadrate, ten plants were selected randomly in each plot for measuring height at different stages of crop growth, total number of tillers per square meter was counted from three places selected randomly at different intervals, plants from 25 cm row length from second rows were selected randomly and were cut close to the ground surface and were sun dried. After sun drying, these samples were put in electrical oven at 60-70 °C till the constant dry weight achieved, the plants of 25 cm row length were taken and green leaves were separated to record their surface area by leaf area meter. All the leaves were grouped into three *viz.*, small, medium and large. Five leaves were taken from each group and their surface area was measured. Area of leaves were multiplied with respective leaf numbers of a group and sum of all three gave the total leaf area. The data recorded during the course of investigation were subjected to statistical analysis using analysis of variance (ANOVA) technique for SPD as prescribed by (Gomez and Gomez, 1984) [3]. Standard error of mean in each cases was calculated at 5% levels of probability.

Results and Discussion

Initial Plant population

Initial plant population showed non-significant result as in case of crop residue management and weed management practices whereas higher number of initial plant population was observed in treatment C_4 i.e. Zero tillage with residue and in case of weed management practices treatment W_2 i.e. Triallate 50% EC PE (2500 gm a.i. ha^{-1}) recorded highest initial plant population

Plant height (cm)

The study examined plant height at different growth stages influenced by crop residue management and weed management practices have been presented in Table 1. The data showed that plant height increased as growth progressed up to 90 DAS, but the rate of increment decreased towards harvest. Plant height was found significantly superior in zero tillage with residue followed by conventional tillage with residue except at 30 DAS in the first year of experiment where plant height recorded non-significant. The results are in accordance with the findings of Kumar *et al.* (2016) [5]. Whereas in weed management practices hand weeding at 20 and 40 DAS shows significant result in plant height while being at par with Clodinafop propargyl 15% + Metsulfuron methyl 1% (60 gm + 4 gm a.i. ha^{-1}) at 60, 90 and harvest stage of crop. The similar finding in case of plant height was also reported by Singh *et al.* (2019) [14] and Para *et al.* (2022) [9].

Number of tillers (m^{-2})

The study examined the impact of crop residue and weed management practices on the number of tillers per square meter during both the years of study are presented in Table 2. The results showed that tiller production increased up to 90 days after sowing and declined irrespective of treatments. Zero tillage with residue produced significantly maximum number of tillers compared to zero tillage without residue and conventional tillage without residue at all stages of crop growth while being at par with conventional tillage with residue. This treatment provided a better growing environment, reducing crop-weed competition and ensuring more availability of moisture and nutrients. The results are in close proximity to those of Mitra *et al.* (2014) [7], Kumar *et al.* (2016) [5] and Kumar *et al.* (2018) [6]. All weed management practices recorded more tillers per square meter than weedy check at all crop stages. Hand weeding at 20 and 40 DAS recorded the highest number of tillers m^{-2} closely followed by post-emergence application of Clodinafop propargyl 15% + Metsulfuron methyl 1% (60 gm + 4 gm a.i. ha-1), while being at par with rest of weed management practices during both the years. Singh *et al.* (2019) [13] and Dheeraj *et al.* (2023) [1] also observed similar results.

Leaf area index (LAI)

The study examined the impact of crop residue management and weed management practices on leaf area index in wheat during both years of study and were presented in Table 3. Leaf area increased slowly until 30 days after sowing, then expanded at faster rates, reaching its maximum at 90 days. The leaf area index was not significantly influenced by various crop residue management practices at 30 days after sowing. However, at 60 days, zero tillage with residue recorded the highest leaf area index compared to conventional tillage with residue, zero tillage without residue, and conventional tillage without residue. The increase in leaf area index may be due to the sufficient moisture availability due to residue, which increased

nutrient absorption and resulted in fully turgid and enlarged green leaves. These results are in agreement with the findings of Kumar *et al.* (2018) [6] and Sudarshan *et al.* (2022) [15] Hand weeding at 20 and 40 days after sowing significantly recorded the highest leaf area index at all stages of growth, while minimum leaf area index was associated with weedy check. Leaf area is directly responsible for synthesis and storage of food material through photosynthesis, which has a significant effect on leaf area index. Similar findings were also reported by Kumar *et al.* (2018) [6] and Dheeraj *et al.* (2023) [2].

Dry matter accumulation (g m^{-2})

The data presented in Table 4 revealed that crop residue management and weed management practices significantly influenced dry matter accumulation at all growth stages during both years of study. The maximum dry mater accumulation was recorded under zero tillage with residue while being on par with conventional tillage with residue and significantly superior over rest of the treatments. This increase in dry matter accumulation may be due to increased plant height, tiller production, and leaf area index in the treatment C_4 i.e. zero tillage with residue. Similar findings was reported by Sudarshan *et al.* (2022) [15]. But in case of weed management practices, hand weeding at 20 and 40 DAS, recorded the maximum dry mater accumulation compared to other treatments. Pre-emergence application of Triallate 50% EC @ 2500 gm a.i. ha^{-1} and Triallate 50% EC @ 1250 gm a.i. ha^{-1} also recorded higher dry matter accumulation compared to weedy check. At 60, 90 DAS and at harvest stage of crop, hand weeding at 20 and 40 DAS was on par with post-emergence application of Clodinafop propargyl 15% + Metsulfuron methyl 1% (60 gm + 4 gm a.i. ha^{-1}. Similar findings were also reported by Shyam *et al.* (2014) [11], Kumar *et al.* (2018) [6] and Singh *et al.* (2019) [14]

Table 1: Plant height (cm) as influenced by weed management practices under varying crop residue management of timely sown wheat (*Triticum aestivum* L.).

Treatment		Plant height (cm)							
		30 DAS		60 DAS		90 DAS		At harvest	
		2021-22	2022-23	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23
A. Main plot (Crop Residue Management)									
Conventional tillage without residue	C_1	18.43	19.35	41.55	42.96	79.80	83.77	91.26	94.81
Conventional tillage with residue (3.0 t ha^{-1} rice residue)	C_2	19.07	21.41	43.84	46.45	83.27	86.85	95.91	98.07
Zero tillage without residue	C_3	18.59	20.31	42.64	44.23	81.61	85.48	94.02	96.43
Zero tillage with residue (3.0 t ha^{-1} rice residue)	C_4	19.37	22.73	47.96	48.97	86.65	88.76	98.33	100.23
SEm±		0.45	0.33	0.64	0.69	0.88	0.70	0.79	0.90
C.D.(P=0.05)		NS	1.15	2.25	2.45	3.11	2.48	2.78	3.16
B. Sub plot (Weed Management Practices)									
Triallate 50% EC PE (1250 gm a.i. ha^{-1})	W_1	19.06	21.92	43.25	44.82	81.60	85.58	93.13	96.11
Triallate 50% EC PE (2500 gm a.i. ha^{-1})	W_2	19.24	21.72	43.52	45.02	82.11	86.43	93.49	96.41
Clodinafop Propargyl 15% + Metsulfuron Methyl 1% WP PoE (60 gm + 4 gm a.i. ha^{-1})	W_3	18.09	19.84	45.68	48.02	85.43	88.50	98.35	100.59
Hand weeding at 20 and 40 days after sowing	W_4	19.84	22.03	46.50	48.51	86.38	89.03	100.98	102.97
Weedy Check	W_5	18.09	19.86	41.03	41.88	78.63	81.53	88.43	90.92
SEm±		0.30	0.47	0.70	0.99	1.02	0.64	1.63	1.44
C.D.(P=0.05)		0.86	1.36	2.03	2.86	2.95	1.85	4.72	4.16

Table 2: Number of tillers (m^2) as influenced by weed management practices under varying crop residue management of timely sown wheat (*Triticum aestivum* L.).

Treatment		Number of tillers (m^2)							
		30 DAS		60 DAS		90 DAS		At harvest	
		2021-22	2022-23	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23
A. Main plot (Crop Residue Management)									
Conventional tillage without residue	C_1	221.25	226.94	298.11	302.11	336.43	341.94	322.24	326.79
Conventional tillage with residue (3.0 t ha^{-1} rice residue)	C_2	236.84	240.61	345.24	348.72	357.01	361.00	339.26	345.85
Zero tillage without residue	C_3	227.54	231.55	307.65	312.02	344.25	350.25	327.90	335.10
Zero tillage with residue (3.0 t ha^{-1} rice residue)	C_4	241.58	244.51	348.94	356.12	365.12	369.00	348.54	353.85
SEm±		2.28	3.10	6.80	7.78	4.12	4.21	3.32	3.41
C.D.(P=0.05)		8.03	10.92	23.99	27.46	14.52	14.85	11.72	12.03
B. Sub plot (Weed Management Practices)									
Triallate 50% EC PE (1250 gm a.i. ha^{-1})	W_1	234.07	237.87	317.88	320.15	343.87	346.24	326.01	331.09
Triallate 50% EC PE (2500 gm a.i. ha^{-1})	W_2	236.86	240.67	323.47	330.75	344.43	351.39	329.50	336.24
Clodinafop Propargyl 15% + Metsulfuron Methyl 1% WP PoE (60 gm + 4 gm a.i. ha^{-1})	W_3	217.40	221.21	362.00	365.94	372.06	376.10	356.71	360.95
Hand weeding at 20 and 40 days after sowing	W_4	252.73	256.53	370.01	374.79	374.14	379.84	359.20	364.69
Weedy Check	W_5	217.96	221.76	251.57	257.17	318.87	324.18	301.01	309.01
SEm±		4.39	4.59	10.64	10.71	5.25	5.17	4.88	4.94
C.D.(P=0.05)		12.70	13.27	30.79	31.00	15.20	14.96	14.12	14.31

Table 3: Leaf area index as influenced by weed management practices under varying crop residue management of timely sown wheat (*Triticum aestivum* L.).

Treatment		Leaf area index					
		30 DAS		60 DAS		90 DAS	
		2021-22	2022-23	2021-22	2022-23	2021-22	2022-23
A. Main plot (Crop Residue Management)							
Conventional tillage without residue	C_1	1.24	1.26	2.45	2.46	3.67	3.68
Conventional tillage with residue (3.0 t ha^{-1} rice residue)	C_2	1.31	1.34	2.77	2.79	4.09	4.10
Zero tillage without residue	C_3	1.24	1.28	2.53	2.54	3.77	3.78
Zero tillage with residue (3.0 t ha^{-1} rice residue)	C_4	1.33	1.35	2.98	3.01	4.17	4.20
SEm±		0.04	0.04	0.03	0.03	0.08	0.09
C.D.(P=0.05)		NS	NS	0.10	0.10	0.28	0.32
B. Sub plot (Weed Management Practices)							
Triallate 50% EC PE (1250 gm a.i. ha^{-1})	W_1	1.32	1.36	2.55	2.57	3.75	3.76
Triallate 50% EC PE (2500 gm a.i. ha^{-1})	W_2	1.34	1.38	2.67	2.67	3.84	3.86
Clodinafop Propargyl 15% + Metsulfuron Methyl 1% WP PoE (60 gm + 4 gm a.i. ha^{-1})	W_3	1.15	1.18	2.87	2.90	4.28	4.31
Hand weeding at 20 and 40 days after sowing	W_4	1.42	1.46	3.07	3.10	4.38	4.40
Weedy Check	W_5	1.14	1.17	2.26	2.28	3.37	3.38
SEm±		0.04	0.04	0.05	0.05	0.08	0.07
C.D.(P=0.05)		0.11	0.11	0.14	0.16	0.23	0.20

Table 4: Dry matter accumulation (g m^{-2}) as influenced by weed management practices under varying crop residue management of timely sown wheat (*Triticum aestivum* L.).

Treatment		Dry matter accumulation (g m^{-2})							
		30 DAS		60 DAS		90 DAS		At harvest	
		2021-22	2022-23	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23
A. Main plot (Crop Residue Management)									
Conventional tillage without residue	C_1	44.09	46.08	314.63	319.48	672.30	681.56	954.24	964.09
Conventional tillage with residue (3.0 t ha^{-1} rice residue)	C_2	53.56	54.91	345.74	349.74	710.96	717.48	1036.01	1053.88
Zero tillage without residue	C_3	46.34	48.46	320.39	325.49	675.78	684.85	961.36	977.38
Zero tillage with residue (3.0 t ha^{-1} rice residue)	C_4	55.74	56.91	361.53	365.68	717.26	722.88	1067.01	1071.54
SEm±		0.65	0.70	7.83	7.21	8.25	8.25	15.58	15.19
C.D.(P=0.05)		2.28	2.47	27.62	25.42	29.12	29.10	54.95	53.60
B. Sub plot (Weed Management Practices)									
Triallate 50% EC PE (1250 gm a.i. ha^{-1})	W_1	49.54	51.19	323.73	328.26	675.47	683.09	960.84	972.07
Triallate 50% EC PE (2500 gm a.i. ha^{-1})	W_2	50.64	52.29	336.49	341.02	681.59	689.21	990.23	1003.19
Clodinafop Propargyl 15% + Metsulfuron Methyl 1% WP PoE (60 gm + 4 gm a.i. ha^{-1})	W_3	46.55	48.20	374.19	378.71	736.84	744.46	1096.36	1108.43
Hand weeding at 20 and 40 days after sowing	W_4	56.20	57.86	380.53	385.06	752.67	760.29	1129.95	1142.02
Weedy Check	W_5	46.74	48.39	262.92	267.44	623.80	631.42	845.83	857.90
SEm±		0.78	0.76	10.67	10.69	10.47	10.45	12.37	12.78
C.D.(P=0.05)		2.24	2.21	30.88	30.94	30.29	30.29	35.80	36.99

Summary and Conclusions

Among different crop residue management, zero tillage with residue was found most effective in maximizing plant height, number of tillers (m^{-2}), leaf area index and dry matter accumulation (g m^{-2}) at almost all the stages of crop followed by conventional tillage with residue during both years. Conventional tillage without residue showed lowest values of all above parameters of crop. While in case of weed management practices hand weeding at 20 and 40 DAS had a significant impact on plant height, number of tillers (m^{-2}), leaf area index, and accumulation of dry matter (g m^{-2}) followed by post-emergence application of Clodinafop propargyl 15% + Metsulfuron methyl 1% (60 gm + 4 gm a.i. ha^{-1}).

Reference

1. Dheeraj BK, Moond V, Ninama J, Saharan K, Singh L. Effect of weed management practices on weed control efficiency, yield attributes, productivity and profitability of wheat. The Pharma Innovation Journal. 2023;12(10):390-393.
2. Dheeraj BK, Moond V, Ninama J, Saharan K, Singh L. Effect of weed management practices on weed dry matter, growth and yield of wheat. The Pharma Innovation Journal. 2023;12(10):394-397.
3. Gomez KA, Gomez AA. Statistical procedures for agricultural research. John Wiley & Sons; c1984.
4. Khokhar AK, Nepalia V. Effect of herbicides and nutrient management on weed flora, nutrient uptake and yield of wheat. Indian Journal of Weed Science. 2010;42:14-18.
5. Kumar A, Jat ML, Kumar A, Tomar J, Kumar S, Kushwaha SR. Rice residue management in wheat under different tillage practices and nitrogen doses. Annals of Agricultural Research. 2016;37(1):49-55.
6. Kumar M, Ghosh D, Singh R. Effect of crop establishment and weed management practices on growth and yield of wheat. Indian Journal of Weed Science. 2018;50:129-132.
7. Mitra B, Mookherjee S, Das S. Performance of wheat under various tillage and nitrogen management in sub-

Himalayan plains of West Bengal. Journal of Wheat Research. 2014;6(2):150-153.
8. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. New Delhi: I.C.A.R.; c1978.
9. Para PK, Kushwah SS, Sasode DS, Joshi E, Sharma VK, Malgaya G. Impact of tillage and chemical weed management practices on wheat yield and nutrient uptake. Biological Forum-An International Journal. 2022;14(1):1726-1734.
10. Punia SS, Singh S, Yadav DB, Sindhu VK, Duhan A. Abundance, distribution and diversity of weeds in wheat in Haryana. Indian Journal of Weed Science. 2017;49(2):187-190.
11. Shyam R, Singh R, Singh VK. Effect of tillage and weed management practices on weed dynamics, weed seed bank and grain yield of wheat in rice-wheat system. Indian Journal of Weed Science. 2014;46(4):322-325.
12. Singh P, Kewat ML, Sharma AR, Sapre N. Tillage and weed management effect on productivity of wheat under soybean-wheat-greengram cropping system in conservation agriculture. Indian Journal of Weed Science. 2017;49(3):226-230.
13. Singh M, Singh O, Singh R. Impact of wheat establishment methods and weed management practices on weed flora, yield and nutrient uptake of wheat in rice-wheat cropping system. Journal of AgriSearch. 2019;6(2):73-77.
14. Singh B, Kumar M, Dhaka AK. Comparative efficacy of tank mixture of post-emergence herbicides for the control of mixed weed flora in wheat. Journal of Pharmacognosy and Photochemistry. 2019;8(2):384-389.
15. Sudarshan S, Shekhawat K, Rathore SS, Singh RK, Das A, Nagargade M. Annals of Agricultural Research. New Series. 2022;43(2):119-126.