



# Study of Weed Prevalence on Rape Crop to Planting Different Time

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**Abstract**

The main purpose of this study was to determine of the weed species and its distribution in the rapeseed fields with different soil cultivation (by mechanic and chemical) and planting time were different (from 13 Apr to 15 May) in fields of "Gatsuurt" CoLTD in the Tsagaannuur soum of Selenge province, Mongolia. A total weed species of the experimental fields was determined by methods of E.I. Liberichtaine and A. Tulikov. Used of herbicides, which are Tornoda 500, Sukhovei, Galion, Miura by "Auvgust" company of Russian were applied by individually and combination on all fields with rape germination was before and after.

Results were given by below. The distribution of weeds were more little (10%=1 point) in fields of cultivation by chemically and mechanically with planting between were between 20<sup>th</sup> April to 5<sup>th</sup> May and were higher medium (34% = 3 point) in field of cultivation by chemically and higher little (25% = 2 point) in field of cultivation by mechanically and lower many (35% = 4 point) in field of stubbles. Additionally, all fields planting time was 10<sup>th</sup> May. Another experimental results given by distribution of weeds determined were little (15%=2 point) in field of cultivation by mechanically and medium (28%=3 point) in field of cultivation by chemically and little many (50%=4 point) in field of cultivation by, settles field with planting time were 15<sup>th</sup> May in all fields. Also, average number of seeds of weeds were determine 517.5-922.6 million in 0 to 20 cm in field's soil by the methods of B.A. Dospikhov et al.

The discovered 96 weeds in per square meter of the field and to applied Tornado 50 against weeds, result was stopped of living process of the weeds were 91.6%. But another experimental were discovered 116 weeds for rapeseed with 2-6 real leaves in per square meter of fields and to applied combination both Miura and Gallion against weeds. Results given 95.7% of weeds were died.

Overall conclusion of all experimental, density of weeds in fields were low/lower on planting by before 10<sup>th</sup> of May but much more after that planting time. Additionally, planting by after 10<sup>th</sup> May was to restricting/blocking for rapeseed living in future. This result suggesting to negative influence for rapeseed product quality.

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**Keywords:** Weed species; Soil cultivation; Herbicide.



## Introduction

In the "State Food and Agriculture Policy" adopted by the Parliament of Mongolia Resolution No. 29 of 2003, increasing the nomenclature of food, technical, oil and fodder crops, in the soil and climate of the region of Mongolia and produce seeds of their localized varieties. Provides a specific part of domestic plant oil needs, and increases the range and production of strategic and import substitute foods. Rape is the main source of food and technical oils and fodder proteins, and lately it has grown considerably as an economically important to planting crop. To embed production is improving soil fertility, and increasing stabilization of grain yields in connection with Mongolian soil and climatic conditions is important for changing crop rotation structure. Planting of rape for 10-15% of grain production is an important issue of cultivation. Therefore our country it is urgent to develop proper cultivation of rape and technology of optimal protection against diseases, pests and weeds.

## Materials and methods

A total weed species and density of the experimental fields was determined by methods of E.I. Liberschtaine and A. Tulik-ov,

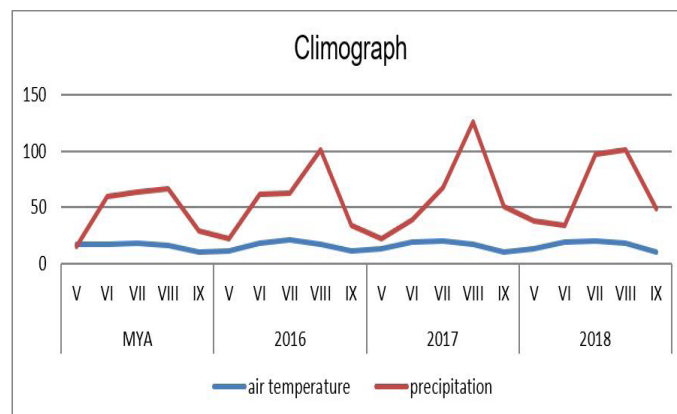
1. The soil samples taken 0-10 cm and 10-20 cm to determine weed seeds in contains soil by method of B.A. Dospekhov,
2. To deem technical result of herbicide,
3. To deem harvest by common method,
4. Production experiment field was 3 variant for soil cultivation per 1000 ha and 5 variant for planting time totaling 15 variants. Tornado 1l/ha, combination of Gallion 0.3l/ha+ Miura 0.8l/ha herbicides were during growth stage, dosage of Tornado 1.5l/ha 1.8l/ha, Sukhovei 1.5l/ha, 1.8l/ha herbicides to reduce seed moisture,
5. Plot experiment are planted mentioned above period, in growing season herbicide was did not used, there are 5 variant of timing difference, 1 plot size was 16m<sup>2</sup> and total was 80m<sup>2</sup>.

**Table 1**

No	Cultivation variant	2017			2018				
		Sown date			Sown date				
1	Mechanical fallow	IV/20	IV/25	V/05	IV/13	IV/19	IV/27	V/05	V/15
2	Chemical fallow								
3	Straw								

In 2017-2018, a total of 15 variants, 5 variants of the planting period and 3 variant of soil cultivation were to function in production experiment with a total area of 1000 ha. Before emerging the plant, herbicide of Tornado tested 1l/ha and combination of Galion 0.3l/ha+Miura 0.8l/ha herbicide applied in 2-6 leaves of rape during the growing season. Also, to reduce seed moisture before harvesting, Tornado herbicides were sprayed at 1.5l/ha, 1.8l/ha, Sukhovei herbicides at 1.5l/ha, and 1.8l/ha, respectively. During this time, the herbicides was not applied in plot experiment weed during the growing season to chose a convenient time.

**climograph 1**



## Climate features of the years studies

Integrating of crop production activities and research results into key of agro climate indicators for the year, Tsagaannuur soum of Selenge province is region of central part of the cultivation area with the moisty chilly summer and cold winters, however the research years was conducted in favorable weather conditions. The average air temperature is 18-20°C in July, the coldest being around 20-22°C in January. The average annual precipitation is 300-350 mm and wind speed 1-3 m/sec. The ground frosts are observed in autumn in August-spring, in late May and early June. Compared MYA (many year average) with the 2017-2018 meteorological data for in the 2017 air temperature was 1.10°C higher, precipitation was 70mm higher, the number of days above 30°C was 21 days, the soil temperature was over 40°C day was 96 days, the number of precipitation days was 63 days, in 2018 average air temperature around the MYA, precipitation was 83.2 mm higher than MYA, number of days above 30 C was 95 days and 60 days with precipitation. The

last spring ground frosts were May 28, 2017, May 22, 2018, and the first autumn ground frosts were August 28, 2017, and September 14, 2018 (climograph 1).

## Results of the study

Calculation study result of rape sown different time in cultivating mechanical, chemical fallow and direct straw field of Gatsurt LLC of Tsagaannuur soum, Selenge province (Table 1).

## Weed research in various soil cultivation variants.

Different types of soil cultivation rape were planted on April 13, 20, 25, May 05, 10, 15. On April 13, the air temperature was 18C at day, -10C at night, the soil temperature was 40C, 70% minimum soil moisture content (MSMC) in 0-10 cm deep. The cultivated rape evenly sprouted around May 9, but in the ground freeze of this day, the emerged seeds were died. Therefore, it was suggested that optimal timing should be compared with MYA. The weed spread on the chemical and mechanical fallow areas planted between April 20 and May 5 was 10% or less (1 point), and on May 10 weed spread was 34% or below

average (3 points) on chemical fallow, 25% or lower (2 points) in mechanical fallow, and 35% or more (4 points) in straw field, weed spread on mechanical fallow planted on May 15 was 15% or lower (2 points), 28% or average (3 points) in chemical fallow and 50% or more (4 points) in the straw field. Therefore spring summer annual and biennial weeds such as Proso millet (*Panicum millaceum* L), Marijiuna (*Cannabis ruderalis* Janisch), *Leptopyrum fumarioides* L, Sieversian wormwood (*Artemisia sieversiana* Willd) was spreading to dominate in the experiment field.

**Research of weed seeds in soil**

The cultivated land contains hundreds of millions of germinative weed seeds and the main reason to determinant of the rate of field pollution is the fact that every year the seeds emerge

and the soil weed seed resorces increasing. The weed seeds were sampled to a depth of 0-20 cm from the soil and identified. 9 weed species belongs to 6 genus and 5 family Amaranth (*Amaranthaceae*), Goosefoot (*Chenopodiaceae*), Bindweed (*Convolvulaceae*), Knotweed (*Polygonaceae*), Grasses (*Poaceae*) and Mallows (*Malvaceae*) weed seeds were detected in soil. Including: Common Mallow (*Malva mohileviensis* Downer), Goosefoot (*Chenopodium album* L), Red amaranth (*Amaranthus retroflexuse* L), Black bindweed (*Polygonum convolvulus* L), Proso millet (*Panicum miliaceum* L), Little lovegrass (*Eragrostis minor* Host) annual 6 weed species seeds were 66.7%, Pink champion (*Silene repens* Patr), curly dock (*Rumex crispus* L) and Field bindweed (*Convolvulus arvensis* L) perennial 3 species weed seeds 33.3% contained /table 2/

Weed seed resource in the soil of rape field (million.pcs)

**Table 2**

No	Variants	Sample depth, cm	The number of weed seeds by biological group (million / pcs)		Total number of seed (million / pcs for 1/ha)
			Annual, Biennial	Perennial	
1	Mechanical fallow	0-10	508.1	211.3	719.4
		10-20	398.3	163	561.3
2	Chemical fallow	0-10	678.2	196.3	874.5
		10-20	419.1	98.4	517.5
3	Straw field	0-10	721.2	201.4	922.6
		10-20	496.0	179.7	675.7

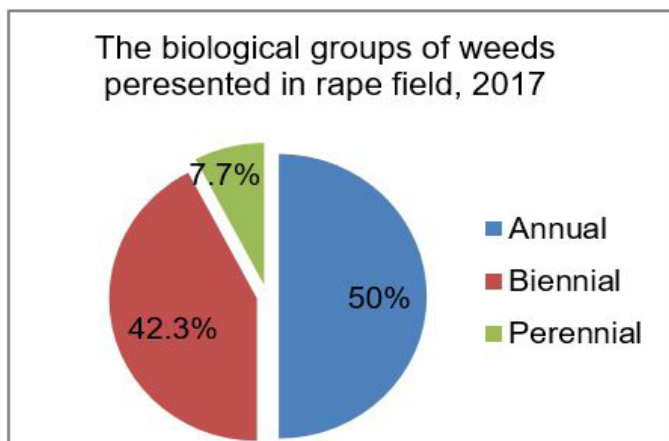
Straw field contains 922.6 million /pcs 0-10cm layer of soil, 675.7 million /pcs 10-20cm layer of soil and it is higher than other variants.

**Weed spread and density of experiment field.**

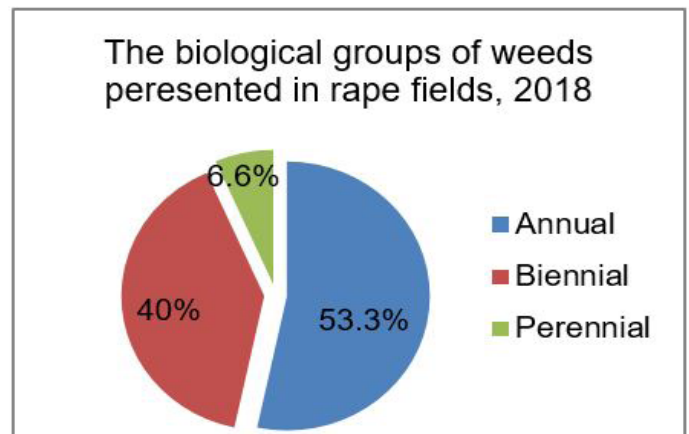
In 2017, 19 weed species belongs to 16 genus, 12 family were identified in the rape field of Tsaganuur soum in Selenge province, 10 species are 50% of annual, 2 species are 7.7% of biennial, 7 species are 42.3% of perennial weeds, in 2018, 16 weed species belongs to 15 genus, 15 family were recorded, 8 species are 53.3% of which were annual, 1 species are 6.6% of biennial, 6 species are 40% of perennial weeds, respectively. (1, 2- diagram).

Weed spread and density of field

**Diagram 1**



**Diagram 2**



The weeds spread in the area of the experiment are classified by species: Proso millet (*Panicum millaceum* L.), Little lovegrass (*Eragrostis minor* Host), Red amaranth (*Amaranthus retroflexus* L.), Black bindweed (*Polygonum convolvulus* L), Goosefoot (*Chenopodium album* L.), slender Russian thistle (*S.collina* Pall), (*Leptopyrum Fumarioides* L.), Tackweed (*Tribulus terrestris* L.), Marijuana (*Cannabis ruderalis* Janisch), Common mallow (*Malva mohileviensis* Downer), Stephen's stork's bill (*Erodium stephanianum* Willd.), Siberian geranium (*Geranium sibiricum* L.), Sieversian wormwood (*Artemisia sieversiana* Willd), Quack grass (*Agropyron repens* L.)

Beauw), Meadow cranesbill (*Geranium pretense* L), Forked leaf (*Potentilla bifurca* L.), Field bindweed (*Convolvulus arvensis* Ln.) Common dandelion (*Taraxacum officinale* Wigg.), British yellowhead (*Inula britannica* L) there were spreading 19 weed species.

### Herbicide result on rape field

When the weeds sprouted on the rapeseed field from seedling to germination, sprayed Tornado herbicide at a dose of 1l/ha and it is eliminating the spring-summer weeds and emerging were evenly growing (Figure 1). Before sown emerge there were counted 96 weeds per 1m<sup>2</sup>.



**Figure 1:** The after the use of Tornado herbicide before the rapeseed emerge.

During the growing season in the rape field with 2-6 leaves, weeds total number counted of 116 per 1m<sup>2</sup> the results were calculated by against broadleaf weeds spraying mixture of Gallion herbicide at 0.3l/ha and Miura herbicide at a dose of 0.8l/ha, respectively (Figure 2).



**Figure 2:** Variants of timing difference before spraying of herbicide.

Technical effectiveness of herbicides, % (rape field)

**Table 3**

No	Variants	Dosage of herbicide, (l/ha)	Decrease of weeds			
			Spraying		Decrease	
			Before /pcs/m <sup>2</sup> /	After /pcs/m <sup>2</sup> /	Number, /pcs/m <sup>2</sup> /	Percentage
1	Tornado	1l/ha	96	7	88	91.6
2	Gallion+Miura	0.3l/ha+0.8l/ha	116	5	111	95.7

The Tornado herbicide sprayed at the production field showed technical results of 91.6%, the combination of Gallion 0.3l/ha + Miura 0.8l/ha herbicide 95.7%. (Table 3, Figure 3).



**Figure 3:** Condition after spraying.

In herbicide-free variants of the timing different field, rape plants were predominantly grown before May 10, but after May 10 cultivated field the weed density was huge, to strangle and rape growth was limited, the pods and the seeds became moldy on their stems, which had a detrimental effect on the quality of the product. Therefore, taking into data the climate condition and soil moisture of the present year, it is necessary to correctly cultivate and carry out plant protection measures in expedient (Figure 4, Table 4).



**Figure 4:** Weeds to strangle around plantations leaves and stem.

Weed density of depending on planting time

(1m<sup>2</sup> field, plot)

**Table 4**

No	Weed species	IV/25	V/05	V/10	V/15
1	Goosefoot	10	15	15	15
2	Black bindweed	8	20	20	20
3	Barnyard millet	-	-	-	4
4	Green foxtail	-	-	-	5
5	Red amaranth		13	20	20
6	Common mallow	3	3	6	6
7	Knotgrass	-	-	2	5
	total	21	51	63	75

**Table 5**

Plantation time	Variants	Plant number of 1m <sup>2</sup>	Number of pods per branch (pcs)	Number of seeds in one pod (pcs)	1000 seed weight (g)	1ha of seed yield (c/ha)
IV/20	Straw	60	33	24	3.11	14.8
	Fallow	72	26	26	3.43	16.7
	Chemical fallow	80	23	23	3.73	15.8
IV/25	Straw	80	30	22	3.01	15.7
	Fallow	70	32	21	4.07	19.1
	Chemical fallow	60	24	22	3.1	9.8

As can be seen from the table, on May 15, in the sown area, summer and autumn annual Green foxtail and Barnyard millet grew 75 pieces per 1m<sup>2</sup>, which is slowed down the growth of rape and affects nocuous the crop.

**Reducing rape seed moisture:** In 65% of the total area before harvest the total field seed moisture content at 24-28%, 7-10 days after spraying Tornado herbicide at 1.5l/ha, 1.8l/ha, Sukhovei herbicide at 1.5l/ha and 1.8l/ha, the amount of moisture decreased to 7.9-8.3% (Figure 5, 6).



**Figure 5:** Seed moisture after 2 days after 5 days after 7 days



**Figure 6:** Condition of reduced rape seed moisture.

**Indicator of rape yield:** Shows the yield structure of time-different variants of straw field, mechanical fallow, and chemical fallow with different backgrounds (Table 4).

Herbicide effect on rape yield

V/5	Straw	78	30	24	3	16.8
	Chemical fallow	80	30	22	3.06	16.2
2018						
IV/27	Straw	58	30	31	3.1	16.7
	Fallow	68	38	28	3.4	16.5
	Chemical fallow	60	35.3	33.3	3.2	22.6
V/5	Straw	51	31	28.6	3	14
	Fallow	56	33	26.3	3.4	16.5
	Chemical fallow	56	30	28	3.1	14.6
V/11	Straw	58	29	26	3.2	13.9
	Fallow	80	25	22	3.2	14.1
	Chemical fallow	58	27	29	3.2	14.5
V/15	Straw	38	33.6	19.4	3.08	7.6
	Fallow	61	25	22	3.01	10.1
	Chemical fallow	44	28	24	3.2	9.5

As for soil cultivation, planted rapeseed on mechanical fallow from IV / 25 to May 11 with an average of 2 years yield was 16.1h / ha, which was best of all other variants. Therefore, mechanical fallow resulted in to set crop conditions on April 25 and 27, when the air temperature was 16 °C at night, -30 °C, the soil temperature was 5 °C and the MSMC was 75% at 0-10 cm depth (Figure 7).

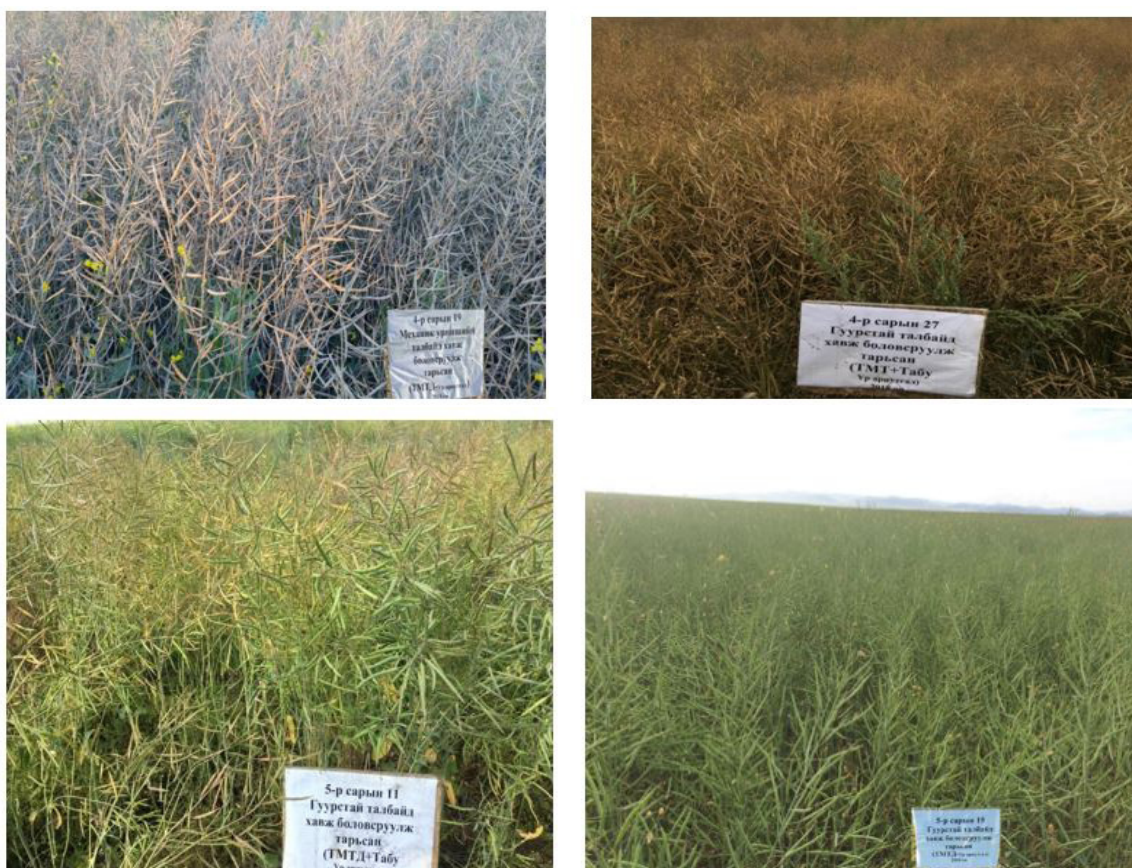


Figure 7: The yield relation between on planting time in production field.

**Biochemical indicators of crop:**

Biochemical indicators of planting different timing rape

No	Time	Sown type	Moisture, %	Butyric, %	Capacitance weight, g/l	Protein, %
		MNS 4791:2005	Not more than 10%	Not less than 40%	Not less than 600g/l	Not less than 18%
1	IV/20	Rape	6.4	42.7	690	27.1
2	IV/25		6.4	44.5	664	25.4
3	V/5		5.1	47.6	651	20.4
4	IV/27		5.5	41.7	650	26.4
5	V/11		7.3	43.7	684	26.4
6	V/15		8	45.8	604	22.4

The biochemical of the rape was analyzed by the laboratory of the Gatsuurt LLC, the amount of moisture, butyric and protein was within the standard level.

### Discussion

S.A. Tastenov has the most important thing is planting dates in the technology of rapeseed cultivation, it is recommended to sow later in the regions of Kazakhstan and Siberia, and when sowing before May 10, the yield was 84.9c / ha, then on 91.4c / ha on 10 and 161.2c on 20 yield of green mass. The researcher also explained that when planted late, moisture growing environment comfortable and it is less to receive damage from the pest.

And V. Medvedev from 1974 to 1976, according to a study of the Ussur Experiment Station in the Krasnoyarsk Territory, it is beneficial when cultivating rape for seed, at the end of April or early May, between rows 15 cm and 10-13 kg per 1 ha (3.5 million pieces) in depth of 1-3 cm.

Rape is relatively little studied in our country, mainly Orgodol KH in the Central region from 1985 to 1987, and Munkhjargal O in the Dornod region from 1991 to 1998. According to Orgodol H's research, May 5-15 was the best time to plant rapeseed in the usual 15cm row, yielding up to 10 c/ha of seed, which was a good idea to grow in a simple row.

The time variants of the above researchers was consistent with the fact that in our study chemical, mechanical fallow and straw fields rape planting from April 20 through May 10, there was a 10-28% lower spread of weeds.

Darkhan PGRFA's researcher Bayarsukh N in 2001-2004, gene fund irrigation field in the central farming region of river Kharaa, Ramrod herbicide at a dose of 7kg/ha against a weeds white bud on the soil was sprayed one day before the spring cultivating and technical result was 84.6%. Fuzialad super herbicide sprayed during growing season when the segmented grass annual and perennial weeds become 10-15 cm, technical results was 2l/ha dose 78.3%, 3l/ha dose 75.2%, 4l/ha dose version 80.2% and yield was increased 2.4-5.5 c/ha. Using chemical method is effective before and after weeding of rape crops and increasing yields were in line with our research.

Researchers Enkhbold N, Azzaya T, Batchimeg T, and Batsaikhan Central area's Modify Survey in 2017, Gatsuurt LLC's wheat and rape non irrigated fields weeds were determined, such as the , Proso millet, Black bindweed, Red amaranth, Goosefoot, Siberian geranium, Sieversian wormwood, Field bindweed, Monkswort. Field weed level was 2-3 point, Proso millet 10, Black bindweed 4p, Monkswort 4 pcs were counted on 1m<sup>2</sup>.

### Conclusion

- 19 species belongs to 16 genus and 12 family weeds were identified, 10 species are 50% annual, two species are 7.7% biennial, 7 species are 42.3% perennial weeds was spread, respectively.
- In the soil sample of the field of experiment, there were 9 species belongs to 6 genus, 5 family weed seeds were identified and which 6 were 66.7% annual, 3 were 33.3% perennial.
- Cultivation of rape in the area of chemical, mechanical fallow and straw field from April 20 to May 10, weed spread was low by 10-28%.
- Tornado herbicide at a dose of 1l/ha result was 91.6% before germinating at the production field and combination of Galion 0.3l/ha + Miura 0.8l/ha was very effective about 95.7% when weeds with 2-6 leaves.
- When seed moisture 24-28% total of 65% field during harvest, all variant of Tornado 1.5 l/ha, 1.8l/ha, Sukhovei 1.5l/ha, 1.8l/ha doses sprayed to reduce the seed moisture, either version was effective, the moisture was reduced to 7.9-8.3% after 7-10 days.
- Plantation of rapeseed in mechanical fallow on IV/25 yield was 19.1c/ha which is higher than other variants.
- When analysing rape the biochemical result was in standard level.

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