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HERBICIDES AND THEIR ROLE IN
SUNFLOWER CULTIVATION

The problem of killing sunflower weeds has not yet been solved. Agrotechnical measures taken on a wide scale do not always result in crop purity. Weed control by hand to kill weeds and obtain high yields is mostly impossible due to the shortage of workforce.

The combination of agrotechnical methods and herbicides is a most reliable and productive method to kill weeds. The VNIIMK began working on the chemical weeding of sunflower in 1956. Over 120 preparations in different doses have been tried. EFK, chlor-EFR, $C_9H_{19}NOS$, prometrine and other herbicides have proved to be effective on sunflower crops.

According to four years data prometrine in the dosage of 2.5 kg/ha reduced crop contamination by 63% of which grass weed contamination was reduced by 61% and cotyledonous weeds by 75%; this helped raise sunflower seed yield from 26.1 to 24.4 c/ha. The trials of this preparation in the Kuban, Don region, Moldavia and Siberia in 1964-1968 showed that it helped increase sunflower yields by 1.5-3 c/ha.

It should be noted that optimal dosing of many herbicides on chernozem soil in the Soviet Union is somewhat higher than in European countries, which is explained by the comparatively high content of organic substances, clay and muck in the soil. Besides, the moisture of the upper soil layer in spring is insufficient for the effect of some herbicides, including prometrine, lynuron, maloran, and tenoran.

Preparations from the anilide group, such as ramrod, acilide, lasso, planavine, trephlane, nitran and nitrophor possess a more prolon-

ged and stable herbicide effect. All these compounds are most active against weeds when mixed with the 5-8 cm soil layer. The best of them are trephlane, nitrophor and nitran in the dosages of 1.5, 2-2.5 and 1.5-2 kg/ha respectively. As our experiments showed, trephlane application is to be combined with pre-sowing cultivation. In this case herbicide application and incorporation and pre-sowing cultivation are effected simultaneously, which helps reduce the number of mechanical soil treatments and diminish trephlane doses to 1,5 kg/ha. Extensive productive check of trephlane effectiveness on sunflower crops showed that weed killing was within the 88-90% range and sunflower seed yield increased from 27.0 to 29.6 c/ha on average over the same period (Table 1).

Band trephlane fertilizing is preferable from the economic view-point because it assures yield additions and totally kills weeds in row-spacings by means of cultivations. Thus in our production experiments trephlane was applied in belts of 30-35 cm width; this helped reduce costs from 35.5 to 18 roubles/ha as compared to the massive method and raise yields by 2.5 c/ha. The net income was 28.3 roubles/ha, while at massive fertilizing it was 10.8 roubles/ha.

In the areas where trephlane effect is lowered due to comparatively resistant weeds such as ragweed, field mustard, abutilon and cocklebur, we recommend using trephlane (1.5 kg/ha) in combination with prometrine (2 kg/ha) or lynurone (4 kg/ha) which are quite toxic to these weeds.

We studied trephlane influence on sunflower plants, and sunflower seed and oil quality, and proved the absence of trephlane residues in seeds; it was shown that trephlane does not depress soil microflora, decomposes in the soil during 5-6 months after application

Table 1
Trepplane Application Efficiency on Sunflower Crops on
Krasnodar Territory Farms

Place of experiment	Weed control, %	Yield, c/ha		Yield difference, c/ha
		trepplane	check	
The Road to Communism' collective farm, of the Timashevsky district	97	30.8	28.5	+2.3
The 'October' collective farm of the Timashevsky district	99	32.8	29.5	+3.3
The 'Kuban' Uchkhodz of Dinsky district	88	25.3	22.9	+2.4
<u>Average</u>	95	29.6	27.0	+2.6

and does not have negative after-effects on winter wheat sown after sunflower.

Home-produced nitrophenol belonging to the anilide group was as effective as trephlane in our experiments (Table 2).

Home prepared nitrate is still more effective. According to 1975 data, when applied in the 1.5 kg/ha dose it killed 95% of weeds; the seed yield was 32.5 c/ha as against 29.8 c/ha in the check i.e. 2.7 higher.

The singleing out of highly effective herbicides and elaboration of rational methods of their application made it possible to introduce substantial changes in the earlier technology of sunflower cultivation which opted for many soil treatments, chiefly for weed killing. However, this goal was not always fully attained due to the unfavourable weather conditions; high yields could not often be obtained without hand weeding. Besides, intensive spring and summer tillage led to undesirable consequences due to intensive soil dispersion facilitating water and wind erosion.

On the basis of years of experimental research we suggest new and promising technology of sunflower cultivation which makes it possible to obtain high and stable yields without hand weeding and with a minimum number of soil treatments.

According to the standard technology soil is tilled 8 or 10 times in spring and summer as against 3 or 4 times according to the new technology. The new technology provides for trephlane application along with pre-sowing treatment.

Generally speaking perspective technology of sunflower cultivation in chernozem soils during spring and summer includes pre-sowing treatment with trephlane application, sowing, and one or two row-spacing cultivations.

Production testing of perspective technology of sunflower cultivation showed its clear

Table 2
 Trephlane and Nitrophor Efficiency on Sunflower Crops, the
 'Friendship' Collective Farm of Tbilisi District,
 1974-1975

Variants	Weeds per m ²	Seed yield, c/ha	Yield difference, c/ha
Check	149	26.0	-
Trephlane 1.5 kg/ha	5	28.4	+2.4
Nitrophor, 2.5 kg/ha	16	28.2	+2.2

Table 3

Effectiveness of Perspective Technology of Sunflower Cultivation

Krasnodar Territory farms	Years	Weed control, %	Seed yield, c/ha	Yield difference, c/ha
			per-standard technology	
'Zavety Ilyicha' collective farm of Ust-Labinsky district	1970-1972	94	29.5 24.6	+4.9
'Ventsy-Zarya' collective farm of Caucasian district	1972-1974	93	29.3 26.0	+3.3
'Friendship' collective farm of Tbilicy district	1973-1974	97	28.4 26.0	+2.4
<u>Average</u>	For experimental years	95	29.0 25.5	+3.5

advantages over the standard technology (Table 3).

95% of weeds were killed and yields increased by 3.5 c/ha on average.

The economy of resources was 7.5 roubles/ha and that of fuel 26 kg/ha owing to the elimination of five technological operations. The net income was 39 roubles/ha due to yield addition.

The wide-scale employment of the new technology of sunflower cultivation will help obtain high and stable yields of this valuable oil crop.