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HOMINA V.Ya., Candidate of Agricultural Sciences, Docent

TARASIUK V.A., Candidate of Agricultural Sciences, Assistant Professor,

Podilsky State Agrarian University

e-mail: homina13@ukr.net; valera-tarasyuk@mail.ru

AGROTECHNICS OF FAT-CONTAINING CROPS GROWING FOR MEDICINE NEEDS

It is shown the results of research on the effects of row spacing and plant density for a given linear meter, and harvesting method (single-phase, two-phase) on yield and seed oil content in the seeds of milk thistle, safflower and flax oil. The dependence of the yield and fat content in the seeds of the studied factors.

Keywords: row spacing, plant density, method of harvesting, yield, fat content, milk thistle, safflower, flax oil

Introduction. It has been used long ago oils of various plants for therapeutic purpose. Milk thistle, safflower and flax oil are noteworthy among the group of fat-containing cultures through exceptional healing properties. The composition of oils of these plants include linoleic and oleic acids, which are essential to the human body, so they can be used as food.

Oil thistle is effectively used for burns flames and hot liquids in the treatment of ulcers, erosions, and prophylactically - to prevent aggravation of peptic ulcer as a means of correction of metabolic diseases in the cardiovascular system. A significant amount of vitamin E makes an oil of milk thistle indispensable to regulate endocrine spheres for men and women [1].

Linseed oil also contains high levels of vitamin E called "vitamin of youth" because it has a beneficial effect on the skin, stops the aging process in the body and reduces the risk of cardiovascular system. Linseed oil is an ideal source of unsaturated fatty acids omega -3, which limit the risk of breast, colon and prostate. These acids cause the death of cancer cells. In the manufacture of medical ointments linseed oil also plays a binding role [2].

Safflower oil has a soothing, firming and nourishing effect on the human skin, regulates cell function, improves circulation, has anti-inflammatory effects, moisture holding and moisture regulating ability and well- absorbed by any skin type, excellent softening it. Linoleic acid content is as high as 90 % in safflower oil, making it an indispensable food product, as this acid in the human body is not formed, but is necessary for normal functioning. Safflower oil also increases muscle tissue and reduces the amount of abdominal fat, controlling the symptoms of the metabolic syndrome [3].

The unique properties of oils and other active ingredients of milk thistle, safflower and flax oil exert healing effects on the human body and is the primary raw material for the manufacture of a number of pharmaceuticals. This is the interest of scientists and medical industry of agriculture, which led to the grounding elements of agroecological technologies of growing of these crops in different soil - climatic zones.

Review of existing publications on this issue. In terms of forest-steppe of the Middle Povolzhia it is carried out the researches on the effects of precursors and foliar fertilization on yield of milk thistle [4]. In the south of Ukraine on irrigated lands of Kherson it is performed the researches on the impact of elements of growing technology (fertilizer, sowing, depth of incorporation, row spacing) on the productivity of milk thistle [5].

A number of studies on methods of sowing and seeding rate of safflower seed are produced in terms of the Astrakhan region [6]. A similar scheme should be submitted to study the influence of these factors on yield of safflower in DSDS "Askaniyske" and the Institute of Oilseed NAASU [7].

The aim of our research was to identify the optimal ratio of row spacing and number of plants in a row to form a habit of plants that have characterized by large number of productive baskets (boxes) with a complete and high seed yield per unit area.

Materials and methods. Research was carried out during 2009-2013 years in terms of "Obolon Agro" Chemerovets'kyi district Khmelnytsky region (the branch of plant breeding, seed production and general biological sciences of PSATU). Experiments were laid in the link of rotation after winter wheat. It was studied varieties: milk thistle - Boykivchanka, safflower - Soniachnyi and flax oil - Iceberg. Accounting area is 25m², quadruple repetition. Accounting productivity was conducted by area method with each variant of the experiment and it was determined the average of all repetitions. Analysis, accounting and monitoring were carried out in accordance with conventional techniques, including "Basic scientific research in agronomy" [8].

Results. Productivity - this is the final score, which is the main criterion for evaluation of all farming practices and other impacts.

In our opinion, the horizontal distribution of plants over an area determines the fate of the future harvest, it is mainly governed by the rate of sowing and planting method.

Yields in our studies varied considerably depending on weather conditions of the year, so in 2011 and 2013, when there was some delay in sowing in 2011 - lack of moisture and as a result, unfriendly and late sprouts, 2013 - low soil temperature and the inability to access the field through the snow, which in some places lasted almost to the end of the first decade of April.

In average for the years of research productivity of milk thistle ranged from 0,42-1,68 t / ha, safflower - 0,98-2,11 t / ha, flax oil - 0,85-2,24 t / ha (Table 1 and 2). It is significantly dependent not only on structural indicators : number of seeds per plant and weight, but also on the number of plants per unit area , because evaluation data shows that the analyzed similarity , survival, biometric and structural parameters , photosynthetic potential variants plant productivity was better at a lower density of crops and productivity - at an optimal structural parameters and the number of plants per unit area.

Table 1

Productivity of fat-containing cultures depending on row spacing, seeding rate and method of harvesting (average for 2009-2013), t/ha

Crop	Row spacing, cm (A)								
	15			30			45		
	Given density of plants per linear meter of row, units (B)								
	50	30	10	50	30	10	50	30	10
Single-phase harvesting (C)									
Milk thistle	0,48	0,81	1,05	0,72	1,03	1,68	0,86	1,10	1,38
Safflower	1,09	1,22	1,87	1,01	1,30	1,61	0,70	1,02	2,11
Two-phase harvesting (C)									
Milk thistle	0,42	0,76	1,00	0,65	0,91	1,51	0,77	0,98	1,30
Safflower	0,98	1,10	1,69	0,91	1,17	1,45	0,63	0,92	1,91
LSD _{0,05} , t/ha milk thistle: A – 0,09; B – 0,09; C – 0,07; AB – 0,15; AC – 0,12; BC – 0,12; ABC – 0,19									
LSD _{0,05} , t/ha safflower: A – 0,06; B – 0,06; C – 0,05; AB – 0,05; AC – 0,11; BC – 0,09; ABC – 0,15									

So the best variant when growing milk thistle was row spacing of 30 cm at seeding rate of 10 plants of linear meter, rate averaged over the years of studies 1,68 t/ha. The maximum yield of safflower 2.11 t/ha was obtained by sowing with row spacing 45 cm, plant density - 10 units per linear meter. Variants with a given density of plants were slightly changed because of biological characteristics of flax oil and differed from variants of safflower and milk thistle.

So, continuous row sowing method, when the number of plants 70 units per linear meter, was the best for flax oil, average yield for the years of research was 2.24 t/ha. The best way to harvest for all three crops was single phase harvesting.

Table 2

**The yield of oil flax depending on row spacing, seeding rate and method of harvesting
(average for 2009-2013), t / ha**

Method of harvesting (C)	Row spacing, cm (A)								
	15			30			45		
	Given density of plants per linear meter of row, units (B)								
	110	90	70	110	90	70	110	90	70
Single-phase harvesting	1,92	2,09	2,24	1,37	1,52	1,18	1,22	1,12	0,94
Two-phase harvesting	1,73	1,88	2,02	1,23	1,37	1,06	1,10	1,01	0,85
LSD _{0,05} , t/ha safflower: A – 0,10; B – 0,10; C – 0,08; AB – 0,18; AC – 0,18; BC – 0,18; ABC – 0,25									

Fat content in the seeds of milk thistle was in the range of 18,7-25,6%, Variants of wide row crops were characterized by the highest rates with plants 10 units per linear meter of row (Table 3).

Table 3

Fat content in the seeds of milk thistle and safflower depending on row spacing, seeding rate and method of harvesting (average for 2009-2013),%

Crop	Row spacing, cm (A)								
	15			30			45		
	Given density of plants per linear meter of row, units (B)								
	50	30	10	50	30	10	50	30	10
Single-phase harvesting (C)									
Milk thistle	20,1	22,7	23,2	21,4	23,1	25,3	21,5	23,8	25,6
Safflower	30,0	30,2	30,3	31,5	31,7	31,7	31,6	32,0	32,2
Two-phase harvesting (C)									
Milk thistle	18,7	21,5	21,9	20,3	22,5	23,8	20,1	22,6	24,0
Safflower	29,1	29,7	30,0	30,5	30,7	30,8	30,4	30,9	31,0
LSD _{0,05} , t/ha milk thistle: A – 0,29; B – 0,29; C – 0,24; AB – 0,50; AC – 0,41; BC – 0,41; ABC – 0,71									
LSD _{0,05} , t/ha safflower: A – 0,16; B – 0,16; C – 0,13; AB – 0,28; AC – 0,23; BC – 0,23; ABC – 0,40									

Variants with row spacing of 45 cm and plant density of 30-10 units per linear meter of row were distinguished by maximum fat content 32,0-32,2% in safflower seed.

Fluctuations of fat content in flax oil seed within 39,2-40,9% did not depend on the studied factors, values were within error (Table 4).

Table 4

**Fat content in flax oil seed, depending on row spacing, seeding rate and method of harvesting
(average for 2009-2013), t/ha**

Method of harvesting (C)	Row spacing, cm (A)								
	15			30			45		
	Given density of plants per linear meter of row, units (B)								
	110	90	70	110	90	70	110	90	70
Single-phase harvesting	39,8	40,3	40,7	39,9	40,6	40,8	39,8	40,7	40,9
Two-phase harvesting	39,2	40,1	40,5	39,4	40,5	40,7	39,4	40,4	40,7
LSD _{0,05} , t/ha safflower: A – 0,22; B – 0,22; C – 0,18; AB – 0,38; AC – 0,31; BC – 0,31; ABC – 0,53									

Conclusions. Our studies demonstrated feasibility of growing of milk thistle, safflower and flax oil under conditions of southern part of western forest-steppe.

Yield of studied crops was dependent on the conditions of the year and on the studied factors. Sowing of milk thistle is recommended to exercise with a width of 30 cm between rows with a given density of plants 10 units per linear meter of row. Safflower should be sown with a width of 45 cm between the rows and 10 plants per linear meter land flax oil - with a width of 15 cm between rows and 70 units of plants per linear meter of row. All crops are better to harvest by single-phase method of harvesting.

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Анотація

Хомина В.Я., Тарасюк В.А.

Агротехніка вирощування жировмісних культур для потреб медицини

У статті висвітлено результати досліджень з вивчення впливу ширини міжрядь та заданої густоти рослин на метр погонного рядка, а також способу збирання урожаю (однофазного, двофазного) на урожайність насіння і вміст жиру в насінні розторопші плямистої, сафлору красильного і льону олійного. Встановлена залежність урожайності та вмісту жиру в насінні від досліджуваних факторів.

Ключові слова: ширина міжрядь, густина рослин, спосіб збирання, урожайність, вміст жиру, розторопша плямиста, сафлор красильний, льон олійний

Аннотация

Хомина В.Я., Тарасюк В.А.

Агротехника выращивания маслосодержащих культур для потребностей медицины

В статье показаны результаты исследований по изучению ширины междурядий и заданной густоты растений на метр рядка, а также способа сбора урожая (однофазный, двухфазный) на урожайность семян и содержание масла в семенах расторопши пятнистой, сафлора красильного и льна масличного. Установлена зависимость урожайности и содержания масла в семенах от исследуемых факторов.

Ключевые слова: ширина междурядий, густина растений, способ сбора, урожайность, содержание масла, расторопша пятнистая, сафлор красильный, лен масличный