https://www.sworldjournal.com/index.php/swj/article/view/swj12-01-005
DOI: 10.30888/2663-5712.2022-12-01-005

UDC 633.15/.34:636.085.52

THE INFLUENCE OF TECHNOLOGICAL METHODS OF GROWING CORN WITH LEGUMES ON THE NUTRITIONAL VALUE OF SILAGE RAW MATERIALS

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Abstract. *The results of research on the study of the influence of technological methods of growing mixed corn crops with high-protein crops on silage on the nutritional value of silage raw materials are outlined. It was established that according to the collection of dry mass, single-spec corn crops exceeded their mixed crops with leguminous crops. However, subject to the introduction of mineral fertilizers in the norm* $N_{120}P_{60}K_{90}$ *and sowing of legumes and cereal components of the mixture in one row, mixed crops provide higher productivity, including protein yield: with soybeans – 0.91-0.99 t/ha, with fodder beans – 0.78-0.88 t/ha.*

Keywords: *corn, legumes, dry matter, digestible protein.*

Introduction.

The main silage crop in Ukraine is corn, the cylos of which is characterized by high energy value, but low protein content. Corn for protein can be due to the use of one of the cheapest ways – to grow it in mixed crops with high-protein crops [2].

In addition to increasing protein content, the development of mixed maize crops with crops rich in protein content consists in combining species that differ significantly in their biological characteristics and attitude to environmental conditions in mixed crops is explained, first of all, by the different time of passage by the components of the herb mixture of critical phases of ontogenesis with the greatest manifestation of stress factors during the growing season [1].

The basic condition for obtaining high yields of legumes and cereal herb mixtures is a reasonable selection of components, their ratio, density of plant standing and fertilization. The composition of the grassmix should be picked up by such species that would not only not compete with each other, but also have a positive effect on each other. For the first time, mixtures of corn with legumes, relative to its single-spec crops, more intensively consume moisture from the soil, and therefore in sufficiently humid years form high yields of vegetative mass. In dry years, these components of the mixture come into competition for moisture and suppress each

other [3].

Among the possible components of growing corn with leguminous crops, its compatible crops with soybeans are most noteworthy, which, like corn, is a plant of late sowing and short daylight hours, and with mixed sowing, their shoots appear almost simultaneously [2, 4]. These crops are characterized by close periods of slow and intensive growth, therefore, with the appropriate varietal selection of components of the mixture at the time of throwing the panicle with corn, the soybeans begin the phase of mass flowering, and during the milky-wax and wax ripeness of corn seeds, soybeans begin the phase of the beginning of yellowing of beans in the lower tier. An important biological feature of soybean plants is their ability to tolerate shading in a joint sowing with corn better than other leguminous crops. In addition to soybeans, good components for growing in compatible crops with corn are feed beans [1, 3].

Meta research – to establish the influence of technological techniques for growing mixed corn crops with high-protein crops on silage on the nutritional value of silage raw materials.

Research materials and methods.

Field experiments were carried out in 2020-2021 on the fields of FG "Dzhupynivske" of Vinnytsia region on gray forest soil. When laying the experiment, a medium-early hybrid of corn Lyubava MV (FAO 270) and a mid-season hybrid of corn DM Duet FAO 320, a variety of soy Medea and a variety of fodder vizier beans were used.

The experiment was laid according to the scheme: Factor A – sowing method (1. Corn (control); 2. Fodder beans; 3. Soy; 4. Corn + soybeans (in 1 row); 5. Corn (1 row) + soybeans (1 row); 6. Corn + fodder beans (in 1 row); 7. Corn (1 row) + fodder beans (1 row); Factor B – norms of mineral fertilizers, kg/ha d. p. (1.Without fertilizers (control); 2. $N_{90}P_{60}K_{60}$; 3. $N_{120}P_{60}K_{60}$). Its predecessor is winter wheat. Corn sowing rate – 80 thousand pcs./ha; soybeans and fodder beans – 220 thousand pcs./ha; in single-seeded crops of fodder beans and soybeans – 600 thousand hectares each.

Results and their discussion.

It is established that regardless of the biological characteristics of the hybrid, for sowing corn in single-spec crops, it forms a greater yield of dry mass than for sowing it in mixtures (Table 1).

Sowing in unde fertilized areas, the crops of the Lyubava MV hybrid ensured the yield of dry matter at the level of 6.22 t/ha, crops of the hybrid of corn DM Duet – 8.29 t/ha. For sowing corn in mixed crops with soybeans, the yield of dry mass was 4.80-7.63 t/ha, for sowing in mixed crops with fodder beans – 4.50-6.82 t/ha. The higher yield of dry matter in mixtures with leguminous crops was noted for sowing the legume and cereal component in one row. Crops of the mid-season hybrid of corn DM Duet accumulated a larger volume of dry matter on all variants.

The introduction of mineral fertilizers had a positive effect on the accumulation of dry mass crops on all variants of the experiment. Its maximum yield was noted on the variants where full mineral fertilizer was applied in the norm $N_{120}P_{60}K_{90}$ and sowed corn in one row with soybeans – 10.71-11.57 t /ha.

Table 1 - The release of dry matter from single-spec and mixed corn crops with legumes to silage, depending on technological measures of cultivation, t/ ha (average for 2020-2021)

Variant	Fertilization		
	without fertilizers	$N_{90}P_{60}K_{60}$	$N_{120}P_{60}K_{60}$
Hybrid corn Lyubava MV			
Corn (control)	6,22	7,60	9,12
Soy	2,32	2,82	3,71
Beans	2,01	2,33	2,92
Corn + soybeans (1)	6,12	7,80	10,71
Corn (1) + soybeans (1)	4,80	6,81	8,80
Corn + fodder beans (1)	5,33	7,52	10,28
Corn (1) + fodder beans (1)	4,50	6,52	8,33
Hybrid Corn DM Duet			
Corn (control)	8,29	9,61	10,56
Corn + soybeans (1)	7,63	9,92	11,57
Corn (1) + soybeans (1)	6,02	8,83	10,85
Corn + fodder beans (1)	6,82	9,43	11,02
Corn (1) + fodder beans (1)	5,93	8,12	9,95
SSD_{05}	0,41	0,61	0,72

The main goal of creating corn mixtures with legumes is to increase the content of digestible protein in silage raw materials, to which, as you know, all corn feeds are poor, leading to their overspending and imbalance of the diet for feed protein.

As a result of the studies, it was found that sowing corn together with leguminous crops dramatically increased the yield of digestible protein with a harvest (Table. 2). Thus, for sowing corn in its single-breed crops on an unprofitable background, the yield of digestible protein with its biomass was 0.40 t/ha in the Lubava MV hybrid, and 0.46 t/ha in the Duet DM hybrid.

The yield of digestible protein in mixtures with high-protein components increased to 0.42-0.57 t/ha per sowing of medium-early hybrid with soybeans or fodder beans and up to 0.46-0.52 t/ha per sowing of the same composition of legumes components, but with a mid-season hybrid of corn row.

The introduction of mineral fertilizers in the norm $N_{120}P_{60}K_{90}$ had a positive effect on the increase in the volume of digestible protein formation in all areas of the field experiment. The amount of collection of digestible protein on single-breed crops of corn was 0.62-0.71 t / ha, on single-breed soybean crops - 0.51 t / ha and on single-breed crops of feed beans - 0.41 t / ha. Lower productivity of feed area from crops of leguminous crops by the yield of digestible protein with a higher content in biomass is due, in comparison with corn, to the low yield of their aboveground mass. Where corn and legumes were s hung in one row: with soybeans – 0.91-0.99 t/ha, with fodder beans – 0.78-0.88 t/ha, depending on the corn hybrid studied. It should also be noted that the provision of feed with digestible protein from crops corn with soybeans in all versions was higher than from crops where mixed corn crops with fodder beans were grown.

Table 2 - The release of digestible protein from single-spec and mixed corn crops with legumes to silage, depending on technological measures of cultivation, t/ ha (average for 2020-2021)

Variant	Fertilization		
	without fertilizers	$N_{90}P_{60}K_{60}$	$N_{120}P_{60}K_{60}$
Hybrid corn Lyubava MV			
Corn (control)	0,40	0,51	0,62
Soy	0,41	0,49	0,51
Beans	0,36	0,40	0,41
Corn + soybeans (1)	0,57	0,71	0,91
Corn (1) + soybeans (1)	0,46	0,59	0,62
Corn + fodder beans (1)	0,50	0,68	0,78
Corn (1) + fodder beans (1)	0,42	0,56	0,58
Hybrid Corn DM Duet			
Corn (control)	0,46	0,57	0,71
Corn + soybeans (1)	0,66	0,80	0,99
Corn (1) + soybeans (1)	0,56	0,68	0,68
Corn + fodder beans (1)	0,59	0,76	0,88
Corn (1) + fodder beans (1)	0,52	0,64	0,65
NIR05	0,03	0,04	0,06

Conclusions and suggestions.

However, with the collection of dry mass, single-shaped corn crops exceeded their mixed crops with leguminous crops. With this technological model, there is also a maximal protein yield from one hectare: with soybeans - 0.91-0.99 t / ha, with fodder beans – 0.78-0.88 t / ha.

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