

The project analyses the development mix of catch crop during the 2019–2021 growing seasons in the Stende Research Center, Latvia. The experiments were performed to measure biomass and dry matter the amount of above ground parts and root parts produced by catch crops and their changes at different sowing dates and different pre-crop. The Mix of catch crops were: 1. Rye (*Secale cereale* L.) + winter rapeseed (*Brassica napus* B.) + phacelia (*Phacelia tanacetifolia* Benth). 2. Oats (*Avéna satíva* L.) + summer vetches (*Vicia satíva* L.) + phacelia. 3. Oats + mustard (*Sinapis alba* L.). 4. Annual ryegrass (*Lolium multijlorum* Lam.) + buckwheat (*Fagopýrum esculéntum* L.) + phacelia. 5 Rough disc (Control, residual weeds in the field). The amount of biomass and dry matter that catch crops produced differed significantly at different sowing dates from year to year. Sowing time had a great effect on biomass and dry matter production. Research was done in the following crop rotation – winter wheat (*Triticum aestivum* L.) and spring barley (*Hordeum vulgare* L.) with catch crops Mix 1-4 and Control. The effectiveness of catch crops depended on the choice of species, sowing time and main crop harvesting time, as well as on weather conditions during the spring and winter period. Rough disc produced the least above ground of green mass part. In the first sowing period - 3.83 t ha⁻¹ and 2.45 t ha⁻¹ in second sowing. Of all the most effective were Mix of catch crops which produced the most above ground of green mass parts, the Mix 3, first sowing period - 9.07 t ha⁻¹ and 5.11 t ha⁻¹ in second sowing..

Material and methods

Scientific research on the study of catch crop was carried out of the AREI Institute, the Stende Research Center (57°11'21.2" N, 22°33'42.2" E). Organization of field experiments, observations and laboratory analyses were carried out according to generally accepted methods. The field experiment was conducted in a basic culture winter wheat where the following agrotechnological activities were carried out. Our attention was also paid to soil type and particle size distribution. The basic crop was grown using the farming technology. The intercrop mixtures were sown after harvesting the main crop with a Väderstad Carrier Drill CRD 300 seeder, discing the stubble before sowing. Intercrop plants continue vegetation until the beginning of the winter period (average day-night air temperature lower than +5 °C). In the Control, the soil is disked, without further processing. In the Control, when determining the biomass, the surface and root mass of weeds and other naturally grown volunteer plants was collected. Intercultural mixtures are created from components of two or more different species, taking into account the list of species recommended to Latvian farmers in order to implement greening requirements in arable land

Table 1. Composition of the catch crops

Working title Catch crop	Composition of the catch crops					
	catch crops	seeding rate, kg ha ⁻¹	catch crops	seeding rate, kg ha ⁻¹	catch crops	seeding rate, kg ha ⁻¹
Mix 1	Rye	50	Winter rapeseed	2	Phacelia	1
Mix 2	Oats	120	Summer vetches	7	Phacelia	1
Mix 3	Oats	50	Mustard	6	-	-
Mix 4	Annual ryegrass	15	Buckwheat	20	Phacelia	1
Control	Rough disc					

Fig 2. Experiment field



We observed that, depending on the year of research, there is a significant change in the increase or decrease in green mass. Each Mix, on average over three years, gave an increase in relation to the control. Cultivation at an earlier time after the predecessor of winter wheat over the course of three years each above ground parts of green mass of the Mix in the first sowing period gave a higher yield than the control. In relation to the later sowing date, where spring barley was used as a precursor. However, a better set of green mass occurs in the early sowing periods, when the sum of active temperatures is higher and there is adequate rainfall.

Conclusions

1. The effectiveness of catch crops depends on the choice of species, sowing time and main crop harvesting time, as well as on weather conditions during the spring and winter period. Rough disc produced the least above ground of green mass part. In the first sowing period – 3.83 t ha⁻¹ and 2.45 t ha⁻¹ in second sowing.
2. Of all the Mix of catch crops, the most effective were Mix 3 (oats + mustard), first sowing period - 9.07 t ha⁻¹ and 5.11 t ha⁻¹ in second sowing, which produced the most above ground of green mass parts and therefore drove more nutrients into the soil in relation to Control (rough disc).
3. The green mass of the root part in first sowing showed the following results – Mix 2 was the best average for three years and amounted to 2.86 t ha⁻¹, which is 0.78 t ha⁻¹ higher compared to the Control. In the second sowing period green mass root parts in Mix 4 was the highest indicator and amounted to 1.87 t ha⁻¹, which is 0.55 t ha⁻¹ higher than the Control.
4. The best above ground* (*1) and root part* (*2) dry matter result in the first sowing period on average over three years was by Mix 3 – 0.39 t ha⁻¹ (1), Mix 2 – 0.43 ha⁻¹ (2). In the second sowing period was Mix 2 – 0.61 ha⁻¹ (1) and Mix 4 – 0.34 ha⁻¹ (2).
5. On average over three years, the percentage above ground and root part of dry matter is higher in the second sowing period than in the first sowing period.
6. Different sowing dates with different pre-crop affect the dry matter of the plants parts and the root system. Sowing catch crops at a later date gives a decrease in green mass both in the above ground plants parts of plants and in the root system.

Acknowledgment

The paper was prepared in the framework of European Innovation Partnership (EIP-AGRI) project “Progressive land cultivation system as the basis for environmentally friendly and effective crop production” (No. 19-00-A01612-000011)