

# Weed Spreading in the Multi-Cropping System

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**Rationale:** Both economic and environmental challenges in the world are increasing interest in multi-cropping system. Multi-cropping system crops is the cultivation of two or more agricultural crops with different biological and agrotechnical characteristics in the same field.

**The aim of the study** was to determine and compare weed spread in the sole (spring barley, spring wheat, pea, caraway), binary (spring barley-caraway, spring wheat-caraway, pea-caraway) and trinary (spring barley-caraway-white clover, spring wheat-caraway-white clover, pea-caraway-white clover) crops.

**Methods:** Field of experiment was carried at Experimental Station of Vytautas Magnus University Agriculture Academy in 2017–2019. The weeds of the crop were evaluated before the harvest of cover crops (spring barley, spring wheat and peas) and caraway in the sole crop, and in the second and third year of caraway cultivation before harvesting in each field in 10 randomly selected sites on 0,06 m<sup>2</sup> accounting plots. Weeds were plucked from the accounting plots and wrapped in paper packages. The number and species composition of weeds were determined in the laboratory, the weeds were dried in cabinet dryer at 60 °C temperature and weighed (Stancevičius, 1979). Number of weeds recalculated pcs. m<sup>-2</sup> and the mass of dry matter in g m<sup>-2</sup>. Caraway seed yield was calculated at a standard 12 percent moisture and absolutely clean amount of seeds (t ha<sup>-1</sup>).

**Results:** In the multi-cropping system crops the most common weeds were *Tripleurospermum perforatum*, *Chenopodium album* and *Sinapis arvensis*. In the second and third years of caraway cultivation, the abundance of perennial weeds in crops increased. In the first year, during main crops cultivation, significantly from 3.0 to 31.6 times higher dry matter mass of weeds was determined in non-sprayed with herbicides binary crops with under sown caraway and in trinary crops with under sown caraway and white clover, compared to sole crops. In the second year, significantly 6.9 and 6.6 times higher dry matter mass of weeds was found in the caraway binary crops, when they were grown after spring barley and spring wheat without white clover, compared to sole crops. In the third year, significantly from 2.7 to 7.4 times higher dry matter mass of weeds was obtained in the caraway binary and trinary crops, when they were grown after barley, wheat and pea without white clover, compared to sole crops. This was due to the intense spread of *T. perforatum* and *Taraxacum officinale* in the binary and trinary crops. In the second year, the highest yield of caraway seeds were formed, when they were grown as binary crop after pea without white clover, in the third year – when they were grown as trinary crop after wheat with white clover.



Figure 1. Caraway and white clover after peas

Multifunctional (Multi-cropping system) crops	Weed dry matter mass, g m <sup>-2</sup>		
	Cultivation year of cover crop (2017)	In the second year of caraway growing (2018)	In the third year of caraway growing (2019)
<b>Sole crop</b>			
Spring barley, spring barley, spring barley	40,8c	5,86b	30,7c
Spring wheat, spring barley, spring barley	8,67d	6,71b	23,5c
Peas, spring barley, spring barley	13,1d	18,3ab	104,4bc
caraway, black fallow	96,0bc	29,7ab	93,8bc
<b>Binary crop</b>			
Spring barley and caraway	120,6b	40,6a	111,7b
Spring wheat and caraway	66,7bc	44,3a	151,9ab
Peas and caraway	59,5bc	22,1ab	279,8a
<b>Trinary crop</b>			
Spring barley, caraway and white clover	181,8b	15,6ab	228,3a
Spring wheat, caraway and white clover	111,3bc	34,5a	136,2b
Peas, caraway and white clover	414,0a	21,9ab	162,7ab

Table 1. Mass of weed dry matter in multi-cropping system crops, 2017-2019.

Note: The differences between the means of the variants marked with the same letter (a, b, c) are significant (P < 0.05).

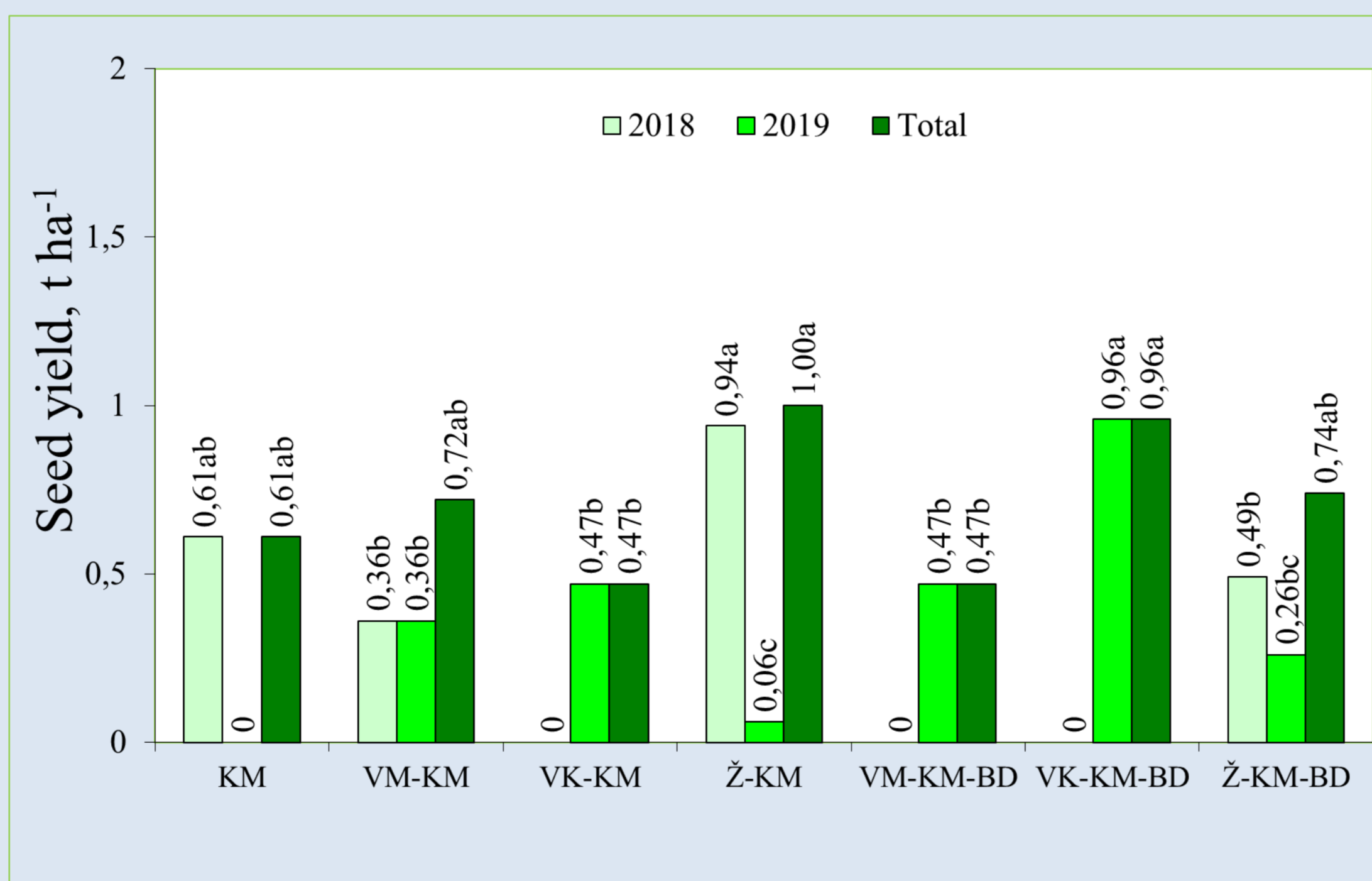


Figure 3. Caraway seed yield, 2018-2019

Note: sole crop: KM - caraway; binary crops: VM-KM - spring barley and caraway, VK-KM - spring wheat and caraway, Ž-KM - peas and caraway; trinary crops: VM-KM-BD - spring barley, caraway and white clover, VK-KM-BD - spring wheat, caraway and white clover, Ž-KM-BD - peas, caraway and white clover. Mean values of variants marked with the same letter (a, b, c) are significant (P < 0.05).

**Conclusion:** In the second and third years of caraway cultivation, the abundance of perennial weeds in the crop increased. In the year of main crop cultivation, the highest weed abundance was found in herbicide-free trinary crops. In the second year of caraway cultivation, the highest weed abundance was found in the binary crops of barley and wheat, and in the third year - in the binary crop of pea. The highest yield of caraway seeds in 2018 formed by growing them in peas (0.94 t ha<sup>-1</sup>), and in dry years 2019 - in barley (0.90 t ha<sup>-1</sup>).

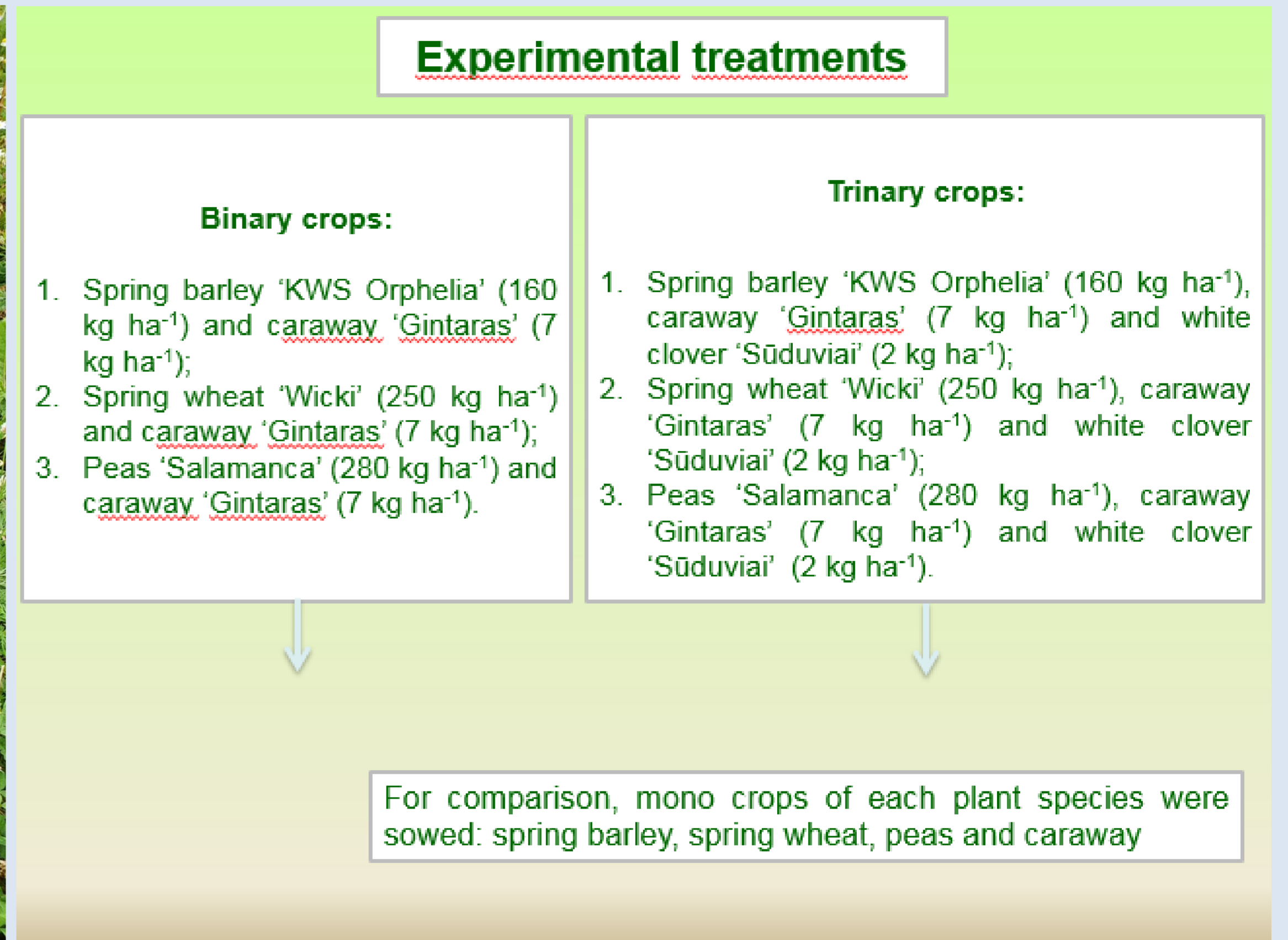


Figure 2. Experimental treatments of multi-cropping system crops

Multifunctional (Multi-cropping system) crops	Number of weeds, pcs. m <sup>-2</sup>		
	Cultivation year of cover crop (2017)	In the second year of caraway growing (2018)	In the third year of caraway growing (2019)
<b>Sole crop</b>			
Spring barley, spring barley, spring barley	78,3c	47,5a	35,4a
Spring wheat, spring barley, spring barley	31,7d	28,4ab	49,6a
Peas, spring barley, spring barley	17,5d	50,4a	74,2a
caraway, black fallow	18,4d	5,42c	37,1a
<b>Binary crop</b>			
Spring barley and caraway	274,6a	9,18bc	44,2a
Spring wheat and caraway	137,5abc	8,33bc	60,4a
Peas and caraway	21,7d	14,2 bc	59,6a
<b>Trinary crop</b>			
Spring barley, caraway and white clover	251,2ab	1,25c	35,4a
Spring wheat, caraway and white clover	121,7bc	4,59c	41,2a
Peas, caraway and white clover	157,1ab	3,75c	45,0a

Table 2. Number of weed in multi-cropping system crops, 2017-2019.

Note: The differences between the means of the variants marked with the same letter (a, b, c) are significant (P < 0.05).



Figure 4. Caraway and pea crop, 2018