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The establishment of alfalfa with field pea-oat mixture as a cover crop

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KEYWORDS: alfalfa, pea, oat, establishment, yield

OBJECTIVE: The aim of this study was to determine the suitability of field pea and their mixture with oat as a companion crop for alfalfa establishment and weeds control.

MATERIAL AND METHODS: The trial was conducted at the Experimental field of the Institute of Field and Vegetable Crops at Rimski Šančevi-Novı Sad, Serbia (45° 20' N, 19° 51' E and 84 m asl) with an average annual temperature of 11 °C and rainfall amount of 611 mm. The trial comprised two sowing years, 2008-2009, and also the first cut in the first full harvest year in 2009 and 2010. The trial was set up as randomized block design in three replicates and included alfalfa pure stand (cv. NS Medijana ZMS V) and row intercropping of alfalfa with different proportions of field pea (P) (cv. Javor) and oat (O) (cv. Dunav) (100% P, 90% P/10% O, 80% P/20% O, 70% P/30% O, 100% O). The sowing was performed in April 2008 and 2009. The plot size was 6 m². In intercropping, field pea and field pea-oat mixtures were firstly sown in 20 cm row spacing and then alfalfa was sown between cover crop rows reducing the distance to 10 cm. Basic seeding rate of alfalfa was 15 kg ha⁻¹, of field pea 200 kg ha⁻¹, and of oat 180 kg ha⁻¹. When the field pea had reached the harvestable stage all plots were cut. At that time, alfalfa was in the vegetative stage (approx. 10 permanent leaves) and oat was in the heading. No herbicides were applied in the trial. The analyses included dry matter yield and weed proportion in the first cut and dry matter yield in other two cuts of alfalfa in the establishment year and the first cut in the following year. Differences between the treatments were tested by ANOVA in STATISTICA 13 software, means were separated by Duncan's multiple range tests and statistical significance was evaluated at p≤0.05.

RESULTS: The interaction year and treatment was not significant. Based on a two-year average, dry matter yield in the first cut ranged from 1.69 t ha⁻¹ in pure alfalfa stand to 6.30 t ha⁻¹ in intercropping alfalfa and 100% oat and the yield decreased with reduced oat proportion in the mixture (Table 1). The lowest total yield in intercropping was recorded in the mixture of alfalfa and 100% pea and the highest in the mixture of alfalfa with 70%P+30%O. The total annual yield of alfalfa pure stand was significantly lower than other treatments (5.53 t ha⁻¹). In the full harvest year, the highest yield was obtained in the treatment alfalfa + 70%P+30%O (6.49 t ha⁻¹). The highest weeds proportion, more than 40%, was in the pure alfalfa stand (Figure 1). In intercropping weeds proportion was less than 10%, reaching the minimum in the intercropping of alfalfa with 70%P+30%O.

Table 1. The effect of pea-oat mixtures in intercropping with alfalfa on the average dry matter yield in the first cut of the two sowing years (t ha⁻¹) (2008-2009), and in the first cut of the following year (2009-2010).

Treatments	2008-2009		2009-2010
	First cut	Total yield	First cut
A + 100% P	3.51d	7.08c	4.92b
A + 90%P+10%O	4.31c	7.63bc	6.39a
A + 80%P+20%O	5.01bc	8.54ab	6.47a
A + 70%P+30%O	5.56ab	8.87a	6.49a
A + 100%O	6.30a	8.35ab	5.18b
100% A	1.69e	5.53d	5.25b

A - alfalfa, P - field pea, O – oat

Means of each cut followed by the same letter are not significantly different from each other at p ≤ 0.05.

CONCLUSION: The obtained results indicate a potential for development of a new, reliable and environmentally friendly method of the alfalfa establishment, without negative effect on the yield in subsequent cuts and the yield in the full harvest year. Intercropping of alfalfa with 70:30 pea-oat proportions is recommended for obtaining good and stable alfalfa crop without suppressive effect on alfalfa re-growth and with the highest effect on weeds control. When sown as the cover crop, an annual forage legume and their mixture with oat, provides an economic yield during the perennial forage crop establishment.

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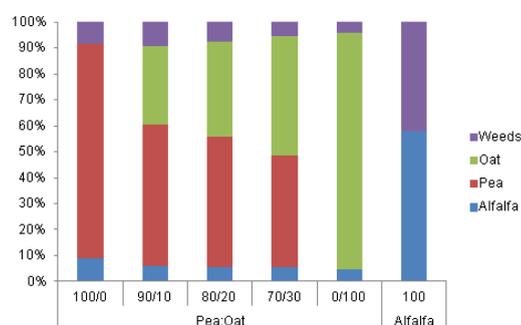


Figure 1. Weeds proportion (%) in the first cut of alfalfa established with field pea-oat mixtures as cover crops.