

THE EFFECT OF YEAR ON FORAGE PRODUCTION OF PERENNIAL CLOVER CROPS ESTABLISHING WITHOUT COVER CROP

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Red clover (*Trifolium pratense* L.) – „Start“ and alfalfa (*Medicago sativa* L.) – „Palava“ were used in the trial with clover crops stands establishing. Clover crops were establishing into 125 mm rows with sowing rate 8 million germinating seeds.ha⁻¹. Yield ability, percentage of different components of yields, yields of stubble cut and different cuts were investigated in the trials. It follows from the results that red clover and alfalfa stands establishing without a cover crop in meteorologically favourable conditions reach the similar yield ability. Unfavourable weather conditions which are manifested in deweeding cut above all in red clover can be equilibrated by stubble cut, so the total yield ability of the stand is comparable with alfalfa stand. In red clover the percentage of weeds in deweeding cut ranged from 1.96 to 70.71% and in alfalfa from 1.80 to 92.18%. The percentage of weeds in clover mass yield is particularly given by amount of weeds in soil reserve and partially by weather conditions at the beginning of vegetation. In alfalfa stands establishing without cover crop it is possible to report a natural decrease of yield ability of different cuts during vegetation. Red clover and alfalfa stands can be establishing successfully even without a cover crop, but under prerequisite of weedless plots and sufficient amount of moisture.

alfalfa; red clover; stands establishing without cover crop; mass production

INTRODUCTION

The aim of this study was to evaluate the effect of the year on establishing of the stands of main clover crops of red clover (*Trifolium pratense*) and alfalfa (*Medicago sativa*) without a cover crop in the years 1978 to 1996. Spring sowings of clover crops without cover crop give the best prerequisites for formation of thick and well involved stands. Risk of establishment at careful soil preparation and precise sowing is minimum. Imperfection of this system of establishment consists in the fact that significantly lower yield of

dry matter is obtained in the year of establishment. Clover crops established without cover crop have very slow growth 40 to 70 days after sowing. Weed infestation is very frequent in this period (Klesnil, 1980). Difference in the action of different factors on the yield between the stand and sowing without cover crop consisted only in negative effect of average bulk of root of the stand without cover crop. It follows from advance of the development of root mass of plants sown without cover crop, and from more severe relationships between different plant organs of the stand (Jamriška, 1996). Alfalfa yield without cover crop varied in the year of establishment according to the sum of precipitation from 4.7 to 10.1 t.ha⁻¹. Stand density of without cover crop was very good compared with underseeding. Matějková (1982) confirm that pure sowing in alfalfa results in totally lower productivity on average. Furthermore, sowing without cover crop requires treatment with herbicides. Total yield was also growing with increasing number of weeds in the stand. Growth of percentage of weed infestation reduced the yield of pure alfalfa (Surovčík, 1990).

MATERIAL AND METHODS

At the Research Station of Faculty of Agronomy of Czech University of Agriculture at Červený Újezd underseedings of clover crops were establishing without a cover crop and into different cover crops during the years 1976 to 1998. The Station is situated in the beet growing region, on luvisols, created by loess covers on shales. Average sum of precipitation for 30 years was 493 mm, 333 mm for the growing season. The use of red clover (Start) and alfalfa (Palava) were dominant. They were sown into rows 125 mm with a sowing rate 8 million of germinating seeds per 1 ha. The size of the plot is 24 m², harvest area is 10 m². The trial was establishing by the method of randomized blocks in four replications. The yield ability of clover crops, percentage of different components (clover crops and weeds) in total yield, yields of stubble cuts and different cuts in the second year of vegetation were studied in the trials. Dry matter content was determined by the laboratory method.

RESULTS

Survey of alfalfa yields and red clover including statistic evaluation is presented in Tables I and II.

It follows from the results that great fluctuations appear in the yields according to different years, as in alfalfa, as in red clover. In comparison of

I. Dry matter yields of red clover in t.ha⁻¹ establishing without cover crop, Červený Újezd 1978–1996

Year of establishment	Dry matter yield in the 1st year of vegetation			Dry matter yield in the 2nd year of vegetation			
	deweeding cut	% of weeds in deweeding cut	stubble cut	1st cut	2nd cut	3rd cut	total
1978	1.88	21.60	2.48	5.07	5.17	3.74	13.98
1979	2.73	34.14	4.49	7.03	3.23	3.83	14.09
1980	2.19	66.18	4.69	4.92	1.98	3.01	9.91
1981	4.64	44.34	2.74	3.94	2.63	1.14	7.71
1982	4.18	19.10	0	6.51	2.54	2.69	11.74
1983	4.17	53.08	4.14	4.01	1.39	3.37	8.77
1984	3.73	9.28	2.85	0	0	0	0
1985	4.59	44.01	4.47	4.69	2.97	3.61	11.27
1986	4.07	54.29	3.62	5.55	0	0	5.55
1987	2.37	10.45	3.84	4.51	4.13	2.95	11.59
1988	1.99	70.71	4.62	6.13	3.65	3.28	13.06
1989	3.15	49.52	4.27	5.99	2.19	0	8.18
1990	1.37	67.15	0	4	3.86	1.13	8.99
1991	2.95	23.38	3.11	7.54	2.96	1.26	11.76
1992	3.62	25.12	1.75	1.53	3.49	1.89	6.91
1993	5.56	52.18	2.5	5.99	1.69	1.72	9.4
1994	2.19	1.96	2.84	6.4	3.62	1.75	11.77
1995	4.36	4.49	2.32	5.57	4.18	3.16	12.91
1996	5.44	9.34	3.08	8.88	3.32	2.09	14.29
LSD 0.05 <i>F</i>	60.792*		32.998*	21.540*	28.595*	32.603*	
<i>F</i> crit.	4.351		4.300	4.4138	4.4134	4.4939	
LSD 0.01 <i>F</i>	60.792**		32.998**	21.540**	28.595**	32.603**	
<i>F</i> crit.	8.0959		7.9453	8.285	8.285	87.531	

the yields of deweeding cut of clover and alfalfa in different years similar yields were obtained, with some exceptions. In the years 1980 and 1992 only the clover and alfalfa yields were highly significantly different in deweeding

II. Dry matter yields of alfalfa in t.ha⁻¹ establishing without cover crop, Červený Újezd 1978–1996

Year of establishment	Dry matter yield in the 1st year of vegetation			Dry matter yield in the 2nd year of vegetation			
	deweeding cut	% of weeds in deweeding cut	stubble cut	1st cut	2nd cut	3rd cut	total
1978	2.05	14.30	2.49	4.4	4.88	3.63	12.91
1979	2.73	28.16	4	6.43	3.53	3.01	12.97
1980	3.57	54.19	3.02	5.77	2.77	3.29	11.83
1981	3.37	9.44	2.51	4.83	3.74	2.42	10.99
1982	4.3	20.38	0	6.24	4.12	3.72	14.08
1983	4.45	18.13	4.63	5.24	3.17	2.46	10.87
1984	3.05	54.31	2.61	0	0	0	0
1985	4	41.25	3.55	5.09	3.19	3.48	11.76
1986	3.74	11.26	2.31	5.87	0	0	5.87
1987	1.89	92.18	3.21	5.64	3.14	2.92	11.7
1988	1.79	50.53	2.16	4.7	4.26	3.05	12.01
1989	3.11	35.05	3.2	5.24	3.6	0.78	9.62
1990	2.39	50.21	0.02	5.32	4.32	2.49	12.13
1991	2.78	8.20	2.74	6.85	3.69	2.51	13.05
1992	6.32	56.89	2.24	5.16	3.88	2.56	11.6
1993	4.72	52.54	2.38	5.98	3.44	2.39	11.81
1994	2.22	1.80	3.65	6.09	4.96	2.45	13.5
1995	3.7	1.91	1.88	5.66	4.32	2.93	12.91
1996	5.45	8.42	2.47	5.3	2.3	2.26	9.86
LSD 0.05 F	30.586*		16.018*	36.763*	15.305*	13.112*	
F crit.	4.4138		4.4939	4.4939	4.4939	4.4939	
LSD 0.01 F	30.586**		16.018**	36.763**	15.305**	13.112**	
F crit.	8.2854		8.5308	8.5308	8.5308	8.5308	

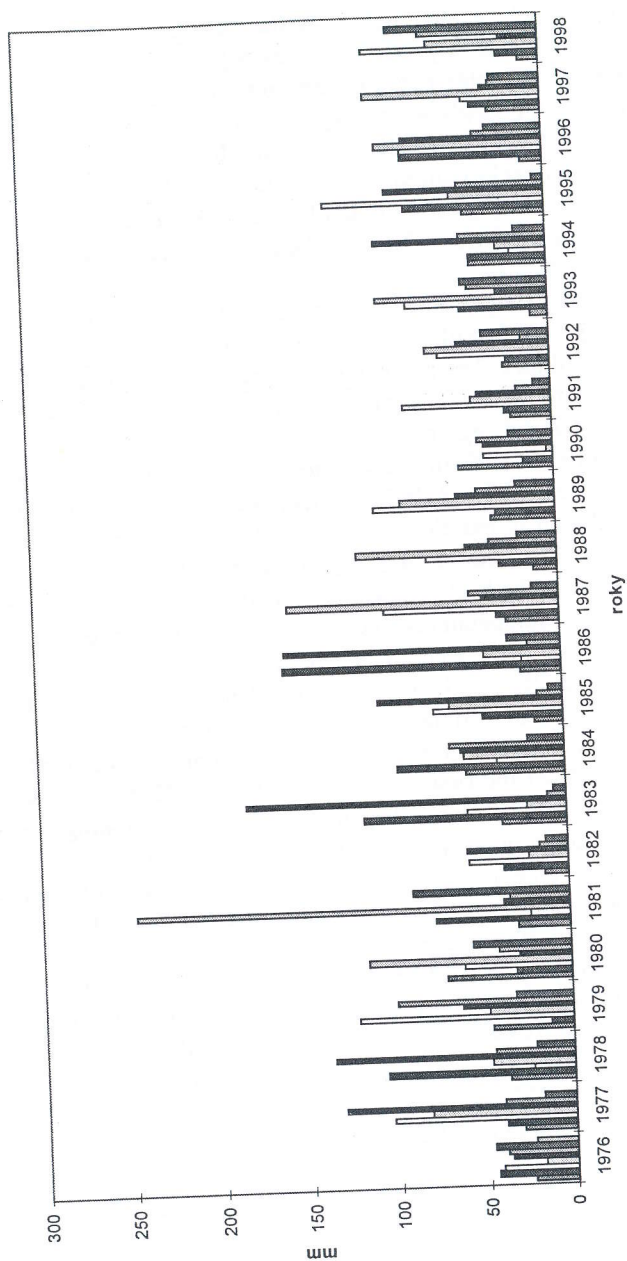
cuts. As it follows from Tables I and II the highest yields were obtained in alfalfa in deweeding cut in the years 1992 and 1996 and in clover in the years 1993 and 1996.

In stubble cuts of clover and alfalfa similar fluctuations were found, but in most cases the yield ability of clover was higher than in alfalfa. In the years 1982 and 1990 stubble cut was damaged in both years by field vole (*Microtus arvalis*) and yields were very low (unmeasurable). Higher yield ability of stubble cut than deweeding cut as in clover as in alfalfa is given by the course of weather conditions. Unfavourable weather conditions which are manifested in deweeding cut particularly in red clover may be equilibrated in stubble cut, so the total yield ability of the clover stand is comparable with alfalfa stand.

In addition tables give percentage of weeds on the yield of deweeding cut. In red clover the percentage of weeds ranged from 1.96 to 70.71% and from 1.80 to 92.18% in alfalfa. The percentage of weeds in the clover mass yield is given above all by an amount of weeds in soil reserve and partially by weather conditions at the beginning of vegetation.

In evaluation of the yields of the second year of vegetation according to different cuts it can be said that alfalfa yields in different cuts and years were more equilibrated than in red clover. It is possible to explain by the region, where the trials were carried out. The region of experimental station at Červený Újezd belongs to the beet growing region which is more favourable for alfalfa cultivation as temperatures and precipitation are concerned. In the years 1984 and 1986 voles were over-reproduced, and hence this caused a great damage to alfalfa stands, therefore the stand was not harvested and these values are not included into statistic evaluation. In red clover this damage of stands appeared in the years 1984, 1986 and in the third cut in 1989. Very low yield of the first cut (1.53 t.ha⁻¹) in 1992 was caused, as it can be seen from graph 1, by deficit of moisture at the beginning and very low sum of precipitation in the year of establishment. In alfalfa stands establishing without cover crop a natural decrease of yield ability of different cuts during vegetation was recorded. In 1978 only higher yield ability of the second cut compared with the first cut was reported. This decrease can be explained by less favourable weather conditions at the beginning of vegetation. In relationship of the second and third cuts higher yield of the third cut in the years 1980 and 1985 was recorded. Higher yield of the third cut in these years was caused by distribution of quitch-grass (*Agropyron repens* L./ Desv.). In evaluation of the results obtained in red clover similar conclusions can be made with exception that this difference was recorded in the years 1980 and 1993.

High significance of dry matter yields in different years of establishing and cultivation of clover crops stands is evident from statistic evaluation.



1. Course of precipitation in the vegetation years 1976–1998, Červený Újezd

roky = years

DISCUSSION

It follows from the given results that it is possible to establish clover crops successfully even without cover crop. Such stands are to be established on weedless plots under prerequisite of sufficient amount of moisture. Similar conclusions were made also by Klesnil (1980), who emphasizes lower yield ability of stands establishing in such way compared with clover crops establishing into cover crop. Matějková's (1982) opinion has been confirmed that a pure sowing in alfalfa gives on average totally lower productivity, above all in the year of establishment. In the second year of vegetation clover crop stands are highly productive and generally they reach comparable yields like the stands establishing into cover crops.

The share of weeds in the yield of clover crop mass ranged from 1.8 to 92.18%, this share is given particularly by amount of weeds in soil reserve and partially by weather conditions at the beginning of vegetation. Surovčík's (1990) opinion was confirmed only partially, that with increasing number of weeds in the stand total yield was increasing and the yield of pure alfalfa was falling by growth of percentage of weed infestation.

References

- JAMRIŠKA, P.: Vplyv vybraných parametrov korenovej hmoty podsevu v kukurici na úrodu krmu lucerny (The effect of selected parameters of root mass of underseeding in maize on the alfalfa fodder yield). Rostl. Výr., 42, 1996: 225–231.
- MATĚJKOVÁ, O.: Omezené způsoby zpracování půdy k letním výsevům vojtěšky (Limited ways of soil cultivation to summer sowings of alfalfa). Rostl. Výr., 28, 1982: 233–248.
- KLESNIL, A. et al.: Příspěvek k problematice zakládání porostů jetelovin (Contribution to the problem of establishing of clover crops stands). Rostl. Výr., 26, 1980: 6.
- SUROVČÍK, J.: Buriny v lucerne a ich vplyv na niektoré úrodnostné prvky (Weeds in alfalfa and their influence on some yield-forming elements). Úroda, 38, 1990: 312–313.

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Vliv ročníku na produkci píce víceletých jetelovin zakládáných bez krycí plodiny. Scientia Agric. Bohem., 30, 1999: 115–122.

Na Výzkumné stanici agronomické fakulty ČZU Praha v Červeném Újezdě byly zakládány jeteloviny bez krycí plodiny v průběhu roků 1976 až 1998. Stanice se nachází v řepařském výrobním typu, na hnědozemích, vytvořených sprašovými pokryvy na opukách. Průměr srážek za vegetační období jsou 333 mm. V pokuse byla použita odrůda jetele lučního (*Trifolium pratense* L.) – „Start“ a vojtěšky seté – tolice

vojtěšky (*Medicago sativa* L.) – „Palava“. Porost jetelovin byl zakládán do řádků 125 mm s výsevkem 8 mil. klíčivých semen.ha⁻¹, sklizňová plocha byla 10 m². Pokus byl uspořádán metodou znáhodněných bloků ve čtyřech opakováních. V pokusech byla sledována výnosová schopnost jetelovin, podíl jednotlivých složek (jetelovin a plevelů) na celkovém výnosu a výnosy strništní seče a jednotlivých sečí v druhém roce vegetace. Cílem práce bylo zhodnotit vliv ročníku na zakládání porostů hlavních jetelovin. Z výsledků uvedených v tab. I a II vyplývá, že porosty jetele lučního a vojtěšky zakládáné bez krycí plodiny dosahují v meteorologicky příznivých letech podobné výnosové schopnosti. Nepříznivé meteorologické podmínky, které se projeví na odplevelovací seči především u jetele lučního, mohou být vyrovnány ve strništní seči, takže celková výnosová schopnost porostu jetele je srovnatelná s porostem vojtěšky. U porostů vojtěšky zakládáných bez krycí plodiny je možné konstatovat přirozený pokles výnosové schopnosti jednotlivých sečí v průběhu vegetace. Pouze v roce 1978 byla zaznamenána vyšší výnosová schopnost druhé seče oproti první seči. Tento pokles můžeme odůvodnit méně příznivými meteorologickými podmínkami na počátku vegetace. U jetele lučního byl podíl plevelů v rozpětí od 1,96 do 70,71 % a u vojtěšky od 1,80 do 92,18 %. Podíl plevelů na výnosu jeteloviny je dán především množstvím plevelů v půdní zásobě a částečně meteorologickými podmínkami na počátku vegetace. Porosty jetele lučního a vojtěšky je možné úspěšně zakládat i bez krycí plodiny, ale za předpokladu bezplevelných pozemků a dostatečného množství vláhy.

vojtěška; jetel luční; zakládání porostů bez krycí plodiny; produkce hmoty

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