

POTENTIAL INTERCROPPING OF SUNFLOWER WITH PEAS

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SUMMARY

The performance of a sunflower (*Helianthus annuus* L.) hybrid at 3 row spacings (92, 122 and 152 cm apart) was compared with intercropping with garden peas (*Pisum arvense* L.) in 1990 and 1991. Sunflower yields were highest at the 92 cm spacing and, in most cases, did better when intercropped, particularly in 1990. The mean yield advantage with intercropping for the 2 years was 8%. Best Land Equivalent Ratio (1.40) was obtained with 92 cm spacing of sunflower intercropped with peas.

Key words: Sunflower intercropping, sunflower yields, pea intercropping.

INTRODUCTION

Intercropping of sunflower with other crops has been practised only in third world countries where land is scarce and labour is plentiful. Lately there has been more interest in the industrialized countries such as U.S. in interseeding sunflower with various legumes mainly to fix the nitrogen and improve soil structure (Kandel and Schneiter, 1993). In their preliminary conclusion from a survey of farmers taking part in the experiment, sunflower yields were not reduced by interseeding legumes. Of the edible legumes, soybeans (*Glycine max* L. Merr.) has been shown to perform well when intercropped with sunflowers. In North Dakota, U.S.A., Zekeng (1980) found that intercropping did not significantly affect the yield of sunflower but reduced yields of soybeans and edible beans (*Phaseolus vulgaris* L.).

The purpose of this experiment was to study the potential of intercropping garden peas with sunflower. Because sunflower is normally planted in rows, usually 92 cm apart, and grows slowly initially, considerable space is available between the rows early in the season that can be utilized. The garden pea seems to be a suitable crop for intercropping because the green pods would be ready for harvesting before the sunflower gets too vigorous and becomes too competitive.

MATERIAL AND METHODS

An experimental sunflower hybrid and the garden pea cultivar 'Green Arrow' were planted either as sole crops or intercropped. Sunflowers were planted in 4.6 m long rows, 92, 122 and 152 cm apart, with and without a row of peas planted between rows of sunflower. Peas were also planted as a sole crop in rows of 46, 61 and 76 cm apart. The design was a 3-replicate split-plot layout with row spacing as main plots and intercropping system as subplots. The spacing within the row was about 25 cm apart for sunflowers and

3 cm for peas. Adequate guards were provided for the one row that was harvested from each plot. The experiment was carried out at the Agriculture Canada Research Station, Morden, MB, in 1990 and 1991 and at Altona, MB, in 1991, but only pea data was collected at the latter test. The pea yield reported here is on dry weight basis, but the actual yield of marketable peas is much higher as they would contain at least 85% water.

RESULTS

Interseeding peas between the sunflower did not depress the yield of the latter crop at Morden (Table 1). In fact, in 1990 the yield of sunflowers was significantly higher when intercropped with peas than as a sole crop. The yields of peas was higher in 1990 than in 1991, probably due to higher moisture conditions. When the two years' data were combined (Table 2), with sunflower only and intercropped data pooled, the yield of sunflower with peas interseeded was significantly higher than with sunflower alone. LER (land equivalent ratio) was always better in the intercropping system than in sunflower or peas alone at all three spacings. Best sunflower yields and LER (1.40) were obtained with sunflower rows spaced 93 cm apart (Table 2).

Table 1. Sunflower and pea yields (kg/ha) at Morden, 1990 and 1991, at different cropping systems.

Crop - Spacing	Yield			
	1990		1991	
	Sunflower	Peas	Sunflower	Peas
Sunflower only - 92 cm between rows	3429		2948	
Peas only - 46 cm between rows		1004		394
Sunflower and peas alternated - 46 cm between rows	3642	254	3231	199
Sunflower only - 122 cm between rows	2622		2633	
Peas only - 61 cm between rows		681		351
Sunflower and peas alternated - 61 cm between rows	3008	234	2535	139
Sunflower only - 152 cm between rows	2694		2199	
Peas only - 76 cm between rows		672		160
Sunflower and peas alternated - 76 cm between rows	3112	210	2301	131
SE (sole or intercropped)	80	21	64	31
SE (spacing)	190	39	116	35
Yield mean (sole)	2915	7.86	2594	301
Yield mean (intercropped)	3254	233	2689	156

The yield of peas, if calculated on per row basis, was reduced by about one-third when intercropped compared to sole crop. In Altona, the yield of peas was only 12% that of sole crop at the 92 cm spacing because of the heavy rains. The heavy sunflower canopy at this spacing did not permit as much drying of the pea foliage, resulting in rotting of the crop.

Table 2. Two-year (1990 and 1991) means of sunflower and pea yields (kg/ha) and land equivalent ratio (LER) at different cropping systems.

Crop-Spacing	Sunflower	Peas	LER
Sunflower only - 92 cm between rows	3188		1.00
Peas only - 46 cm between rows		699	1.00
Sunflower and peas alternated - 46 cm between rows	3436	226	1.40
Sunflower only - 122 cm between rows	2627		0.82
Peas only - 61 cm between rows		516	0.74
Sunflower and peas alternated - 61 cm between rows	2771	186	1.14
Sunflower only - 152 cm between rows	2446		0.77
Peas only - 76 cm between rows		416	0.60
Sunflower and peas alternated - 76 cm between rows	2706	170	1.09
SE (sole or intercropped)	86	144	
SE (spacing)	90	36	
Yield mean (sole)	2754	544	
Yield mean (intercropped)	2972	195	

DISCUSSION

Sunflower-pea intercropping system could produce several immediate economic benefits. Besides the possible yield increase of sunflowers, an additional crop would be harvested from the same land. If the peas grown are of the garden type, they would be harvested early before much sunflower canopy and root system has developed and thus avoiding competition.

The other benefits from such a system is the addition of nitrogen to the soil by the peas and improving soil texture. The benefit would occur even if the pea crop is not harvested at all. These benefits have been shown to occur with forage legume crops in North Dakota, U.S.A. (Kandel and Schneiter, 1993).

Sunflower-pea intercropping system seems to be better adapted in drier areas. Peas appear to be more sensitive to humid conditions, which results when the sunflower canopy prevents adequate ventilation. If intercropping is practised in the more humid areas, a wider row spacing of sunflowers probably would be more desirable.

Additional research on such cropping system could be useful. It is likely that certain other variety combinations of the two crops would give better returns. For example, an early maturing pea variety intercropped with a late maturing dwarf sunflower variety is likely to give better combination. Peas planted earlier than sunflower could improve the yield of the peas. The importance of placement of peas in relation to sunflower rows could also be investigated. The yield of peas might be further increased by growing more than one row of peas, particularly with 152 cm spacing of sunflowers.

REFERENCES

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POTENCIAL DEL CULTIVO ASOCIADO DE GIRASOL Y GUISANTE**RESUMEN**

El comportamiento de un híbrido de girasol (*Helianthus annuus* L.) en tres espaciamientos entre hileras (92, 122 y 152) fue comparado con cultivo asociado con guisante (*Pisum arvensa* L.) en 1990 y 1991. Los rendimientos mas altos de girasol tuvieron lugar con un espaciamiento de 92 cm y, en la mayoría de los casos, se comportó bien en cultivo asociado, particularmente en 1990. La ventaja en rendimiento medio con cultivo asociado fue del 8% durante dos annos. La mejor relación del equivalente de tierra (1.40) se obtuvo con un espaciamiento de 92 cm con girasol asociado con guisantes.

ROTATION POSSIBLE DU TOURNESOL AVEC LE POIS**RÉSUMÉ**

En 1990 et 1991, nous avons comparé les performances d'un hybride de tournesol (*Helianthus annuus* L.), cultivé sous trois espaces entre rangs différents (92, 122, 152 cm) avec une rotation à base de pois (*Pisum arvense* L.). Les meilleurs rendements de tournesol ont été obtenus avec un espace entre rangs de 92 cm et dans la plupart des cas se sont trouvés améliorés par la rotation (spécialement en 1990). Sur deux ans, le gain de rendement moyen avec rotation a été de 8%. Le meilleur rapport en "terre équivalent" (1,40) résulte d'une culture de tournesol avec rotation pois et espace entre rangs de 92 cm.