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Effects of Intercropping (Canola-Faba Bean) on Density and Diversity of Weeds

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Abstract

In order to evaluate the biological effect and interference of crop and weed in canola-faba bean intercropping in comparison with mono culture, an experiment was conducted in randomize completely blocks design with three replication at Ramin Agriculture and Natural Resources, University. In this experiment treatments were different compositions of canola (*Brassica napus* L. var. *haylo*) and faba bean (local cultivar). Plant densities (0, 20 and 40 plants per m^2) for canola and four levels include (0, 20, 40 and 60 plants per m^2) for faba bean in accordance with additive form mixed culture system respectively. Weed dry weight was affected by culture system and different levels of plant densities in mixed culture and there were significant difference 1%. Lowest weed dry weight was obtained in 20-60 and 40-60 plants m^{-2} canola-bean intercropping. In the intercropping parts only two species was observed while in the sole culture more than three species were exist. Results showed that with increasing in bean diversity, weed dry weight declines. According to our results, it is possible to control weed effectively by using intercropping system, but more studied is required. Diversity of weeds had been clearly affected. Results showed that only *Beta* and *Malva* species were existed in intercropping comparing to sole cultures that *Brassica*, *Beta*, *Rumex* and *Malva* were existed.

Keywords: intercropping, canola, faba bean, weed control and diversity of weed

Introduction

Intercropping is the agricultural practice of cultivating two or more crops in the same farm and at the same cropping season (Andrews and Kassam, 1976). In intercropping farming system, usually one main crop and one or more were used as added crops (Saka, 2007). The two or more crops used in an intercrop may be from different species or different plant families, they can simply be different varieties or cultivars of the same crop species, such as mixing two kinds of barley seed in the same farm. Main purpose of intercropping is to produce a greater yield on a given piece of land by making use of resources in the way of maximum efficiency. Making attention to the soil, climate, crops, and varieties are very important. Two of intercropping strategies are planting a deep-rooted crop with a shallow-rooted crop, or planting a tall crop with a shorter crop that requires partial shade (Sobkowiez, 2006). Intercropping provides an efficient utilization of environmental resources, decreases the cost of production, provides higher financial stability for farmers, decreases pest damages, inhibits weeds growth more than monocultures, and improves soil fertility through nitrogen increasing to the system and increase yield and quality (Francis *et al*., 1976; Willey, 1979). It is now clear that the weeds could interfere with crops by increasing competition (for light, water, nutrients and space) and/or allelopathy. Weeds declines many of crops yields and it lead to higher cost in agricultural productions (Wanjari *et al.*, 2001; Pandya, *et al.*, 2005; Singh *et al.,* 2001). There is need to develop the best cropping pattern to increase the production of canola and wheat crop concomitantly. It has been shown that intercropping helps in increasing farm income (Kalra and Gangwar, 1980) while Mandal *et al.* (1985) reported that intercropping of wheat, mustard and chickpea decreased number of fruiting branches per plant, number of pods per plant and 1000 seed weight. Sharma *et al.* (1986) reported that plant density showed significant difference by intercropping of wheat and mustard comparing to mono culture. Found that highest land equivalent ratio (LER) was obtained by intercropping wheat and rape in a 1:1 row ratio. Singh and Pal (1994) reported that intercropping of wheat and mustard reduced the seed yield than their pure stands. Whereas, Ayisi *et al.* (1997) concluded from their experiment on canola-soybean intercropping that seed oil content increased compared with sole cropping. Likewise, Verma *et al.* (1997) reported that intercropping of wheat and Indian mustard gave maximum net return, benefit-cost ratio and land equivalent ratio. One of the most advantages of using herbicides is simplified weed control, but the use of herbicides, not only is costly but also selection of herbicide-resistant weed biotypes seriously become an environmental contamination factor now a day. Herbicide use reduction is one of the main target of sustainable, and

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so several alternatives being investigated, including intercropping.

The objective of this study was to evaluate the effects of canola and faba bean intercropping on weed control (density and diversity).

Materials and methods

This experiment was carried out in the research farm of Ramin agriculture and Natural Resources University, located 36 Km northwest Ahwaz in 31 degree and 36 min geographic latitude, in 2004-2005. In this research intercropping of canola ('Hyola 401' cv) and faba bean (local) was investigated. Canola was planted in two 20 and 40 shrubs m^{-2} densities and faba bean in 0, 20, 40 and 60 shrubs m^{-2} densities. Experimental design was randomized complete block design, with three replicate. Each plot includes six furrows with 75 cm distance and four meter length, that one cultivation line of each one of two crops is located on those. Treatment was different combination on two crops (canola and faba bean). Treatment of sole culture was used as controls. With the notice of importance of weed status in this research, no chemical nor mechanical weed control procedure were used. Sampling of weeds, in order to evaluate of mixed culture effects on weed status, was done. Weeds were collected at the end of February from the flora and labeled. Diversity and density of weeds in different combination of mixed culture and sole culture were investigated. Then dry weight was analyzed. Agronomic index of Land Equvalent Ration (LER) was calculated using Akter *et al.* (2004) formula. Data were analyzed using SAS 9.2 and Mstat-C.

Results and discussion

Weed dry weight

Analyze of variance shows significant difference of different densities of canola and bean intercropping on weeds dry weight comparing to controls (Tab. 1). Lowest weed dry weight was observed on 20 and 40 canola shrubs m^{-2} and 60 bean shrubs m^{-2} (5.64, 6.96 gr/m^2) respectively. Highest weed dry weight was achieved in sole canola with 20 and 40 shrubs m^{-2} (Tab. 2). Leibman and Dyck (1993), reported that weed dry weight will decrease in intercropping treatments comparing to sole cropping. Morphological and capability of faba bean in competition with other crops showed most reasonable effects on reducing weed dry weights. Intercropping of *Triticale* and faba bean reduces weed population (Sobkowiz, 2006).

Increase in faba bean population in 20 and 40 shurbs m^{-2} canola densities resulted lower weed dry weight (Fig. 1, 2).

Tab.1. Analyze of variance of weed dry weights by canola and faba bean intercropping

SOV	Df	Weed dry weight
Replication	2	692.314
Treatment	7	1437.38**
Error	14	3771679

Tab. 2. Weed dry weights by different densities of canola and faba bean intercropping

Canola- Faba Bean densities	Weed dry weight
0-40	47.01 ab
20-40	13.40 bc
40-40	10.24 c
60-40	6.96 c
0-20	64.45 a
20-20	26.95 bc
40-20	7.81 c
60-20	5.64 c

Similar latter(s) in each column shows non-significant difference

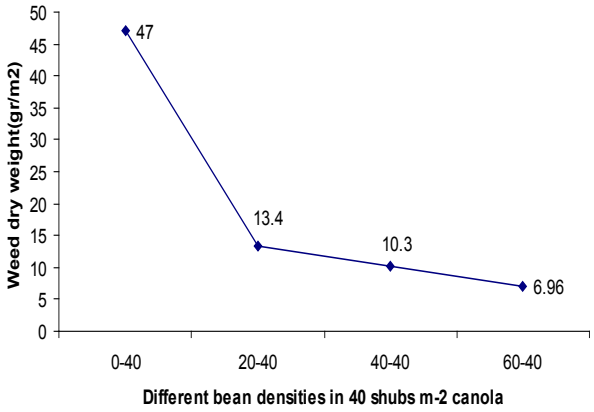

Fig. 1. Effects of different faba bean densities in the intercroppingwith 40 shrubs m^{-2} canola on weed dry weight

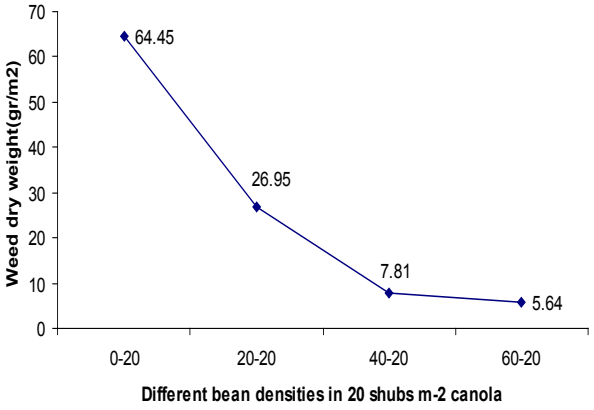

Fig. 2. Effects of different faba bean densities in the intercropping with 20 shrubs m^{-2} canola on weed dry weight

Tab. 3. Role of canola and faba bean in decreasing weed dry weight

Canola-Bean densities	Weed dry weight	% dry weight from sole culture	% decrease in dry weight from sole culture	Role of one bean in decreasing weeds dry weight
0-40	47.01	100	0	0
20-40	13.40	28.5	71.5	3.6
40-40	10.24	21.7	78.3	1.96
60-40	6.96	14.8	85.2	1.42
0-20	64.45	100	0	0
20-20	26.95	41.8	58.2	2.91
40-20	7.81	12.1	87.9	2.2
60-20	5.64	8.8	91.2	1.52

Sole culture of canola exhibited higher weed dry weight and increase in bean densities resulted lower weed dry weight. This was more clear in 20 shrubs m^{-2} canola, (Fig. 1, 2).

Lower weed density in sole bean culture comparing to sole canola culture, might be because of the higher performance of bean in the competition with weed.

High growth rate, faster canopy closer and covering soil surface for a long time might be good reasons for lower weed densities in the bean parts of the farm.

Role of bean in decreasing weed's dry weight in the canola 20 and 40 shrubs m^{-2} is different. In the other hand canola density is critical factor for effects of bean on weed dry weight.

Diversity of weed species

Diversity of weed species is varying form sole and intercropping culture (Tab. 4).

Weed diversity significanty decreased in intercropping system and it exhibited that farming systems could affected dry weight, diversity and density of weeds in farm. Faba bean has a positive role in controlling weeds of canola and this role is more obvious in lower canola population. Canola seed oil contents affected by different intercropping patterns. Maximum seed oil content (44%) were obtained with canola planted alone and remained statistically on a par with canola + one row of wheat which produced 41.6% seed oil content. However, minimum seed oil content (39.8%) were recorded in a three rows wheat intercropping pattern (Zulfiqar *et al.,* 2000).

Tab. 4. Diversity of weed species is in sole and intercropping culture

Weed species	Culture
Brassica kaber, Beta maritima, Rumex and *Malva*	Sole Canola
Brassica kaber, Beta maritima, Phalaris and *Malva*	Sole Bean
Beta maritima and *Malva*	Intercopping

Land Equivalent Rate showed different pattern in seed yield in different mixture compositions. Minimum LER (69%) was observed in 40 canola 20 bean (Shrubs m^{-2}). LER which calculated in low densities of canola (20 shrubs m^{-2}) was lower than 40 canola, in all compositions of mixed culture. It might be the result of effects of increase in number of bean shrubs per unit area and so grain yield of mixture cropping increase and less land was needed to produce grain yield comparing to sole culture. Maximum LER (204%) was obtained in 20 canola shrubs m-1 mixed with 60 bean shrubs m^{-1}. Mandal *et al.* (1985) reported that intercropping of wheat, mustard and chickpea could significantly decrease number of fruiting branches per plant, number of pods per plant and 1000 seed weight. Zulfiqar *et al.* (2000) reported that number of pods per plant in sole canola was higher comparing to intercropping with wheat. Also they reviled that intercropping treatments with two and three rows of wheat exhibited minimum number of pods $plant^{-1}$. The decrease in number of pods per plant of canola was result of mutual competition among the two crops for different soil resources. Reduced weed rate of occurrence in canola by intercropping depends on several factors, including species selected to be intercropped (Skóra Neto, 1993), fertilizer doses (Olasantan *et al.*, 1994). Efficacy of cover crops depends widely on soil coverage (> 50%), in fact obstruction of light is the most important effect (Steinmaus *et al.*, 2008). Cover crops could inhibit weed seed germination by a rapid occupation of the open space between the main crop rows, and reducing weed seedling growth and development. Silva et al, 2009 reported that intercropping of corn and cowpea significantly decrease density of weed species, for example, *Dactyloctenium aegyptium, Evolvulus ovatus, Herissantia crispa, Passiflora foetida* and *Waltheria indica.* Weed seed germination may be inhibited by two mail reasons, first complete light interception due to cover crop and second existence of allelochemical secretion. After weed seedling establishment, resource competition becomes the cover crop's main weed control mechanism of cover crop (Hollander *et al.*, 2007).

References

Ayisi, K. K., D. H. Putnam, G. P. Vance, M. P. Russelle and D. L. Allan (1997). Strip intercropping and nitrogen effects on seed, oil and protein yields of Canola and Soybean. Agron. J. 81:23-9.

Andrews, D. J. and A. H. Kassam (1976). The importance of multiple cropping in increasing world food supplies, pp. 1-10 in R.I. Papendick, A. Sanchez, G.B. Triplett (Eds.), Multiple Cropping. ASA Special Publication 27. American Society of Agronomy, Madison, WI.

Francis, C. A., C. A. Flor and S. R. Temple (1976). Adapting varieties for intercropping systems in the tropics. In:

Papendick R. I., P. A. Sanches and G. B. Triplett. (eds). Multiple cropping. Special publication number 27. Pp. 235-253. Madison. American Society of Agronomy.

Hollander, N. G., L. Bastiaans and M. J. Kropff (2007). Clover as a cover crop for weed suppression in an intercropping design. I. Characteristics of several clover species. Eur. J. Agron. 26(2):92-103.

Kalra, G. S. and B. Gangwar (1980). Economics of intercropping of different legumes with maize at different levels of N under rainfed conditions. Indian J. Agron. 25:181-5.

Libman, M. and E. Dyck (1993). Crop rotation and intercropping strategies for weed management. Ecol. Applied. 3:92-122.

Mandal, B. K., S. Dasgupta and P. K. Roy (1985). Effect of intercropping on yield components of wheat, chickpea and mustard under different moisture regions. Zeitschrift fur Acker Und Pflarizenbau India. 155:261-7.

Olasantan, F. O. and E. O. H. C. Lucas Ezumah (1994). Effects of intercropping and fertilizer application on weed control and performance of cassava and corn. Field Crops Res. 39(1):63-69.

Pandya, N., G. S. Chouhan and V. Nepalia (2005). Effect of varieties, crop geometries and weed management on nutrient uptake by soybean (*Glycine max*) and associated weeds. Indian J. Agron. 50(3):218-220.

Saka, J. O., O. N. Adeniyan, S. R. Akande and M. O. Balogun (2007). An economic evaluation of intercropping Affirican yam bean, Kenaf and maze in the rain forest zone of Nigeria. Middle East J. Sci. Res. 2:1-8.

Sharma, K. C., Y. Singh, P. C. Gupta, S. K. Tripathi, A. K. Bhardwaj and S. P. Singh (1986). Plant population and special arrangement in wheat-mustard intercropping. Indian J. Agron. 31:154-7.

Singh, O. and M. Pal (1994). Performance of wheat + mustard intercropping system in limited irrigation conditions. Ann. Agric. Res. 15:255-9.

Singh, V. B. and G. Giri (2001). Influence of intercropping and weed-control measures on suppression of weeds and productivity of spring season sunflower (*Helianthus annuus*) and groundnut (*Arachis hypogaea*). Indian J.A gron. 46(3): 440-444.

Silva, P. S. L., O. F. Oliveira, P. I. B. Silva, K. M. B. Silva and J. D. Braga (2009). Effect of cowpea intercropping on weed control and corn yield. Planta Daninha, Viçosa-MG. 27(3): 491-497.

Skóra Neto, F. (1993). Controle de plantas daninhas através de coberturas verdes onsorciadas com milho. Pesq. Agropec. Bras. 28(10):1165-1171.

Sobkowiez, P. (2006). Comparsion between triticale and field beans in addetive intercrops. Plant Soil Environ. 52:47-56

Steinmaus, S., C. L. Elmore, R. J. Smith, D. Donaldson, E. A. Weber, J. A. Roncoroni and P. R. M. Miller (2008). Mulched cover crops as an alternative to conventional weed management systems in vineyards. Weed Res. 48(1):273-281.

Verma, U. N., S. K. Pal, M. K. Singh and R. Thakur (1997). Productivity, energetics and competition function of wheat (*Triticum aestivum* L.) plus Indian mustard (*Brassica juncea* L.) intercropping under varying fertilizer level. Indian J. Agron. 42:201-4.

Wanjari, R. H., N. T. Yaduraju and K. N. Ahuja (2001). Nutrient uptake by sunflower (*Helianthus annuus*) and associated weeds during rainy season. Indian J. Agron. 46 (3):541-546.

Willey, R. W. (1979). Intercropping: its importance and research needs. Part II. Agronomy and research approaches. Field Crops Research. 32:1-10.

Zulfiqar Ali, M. A. Malik and M. A. Cheema (2000). Studies on Determining a Suitable Canola-Wheat Intercropping Pattern. International Journal of Agriculture and Biology. 1(2):42-44.