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Short Communication

Weed control using methanol and triple intercropping– A preliminary study

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ABSTRACT:

Row cropping is one of the common forms of multi-vessel systems that is widely defined and varied in cultivating at spatial and temporal dimensions. One of the main benefits of crop cultivation is increasing the efficiency of using available resources and increasing productivity towards pure crop. Other benefits of mixing cultivation include better soil coverage, better control of weeds and reduced leaching of nutrients. The test results showed that the plants that have a modest growth are relatively slow. If planted in a single crop, a lot of weed grows in the field, which, if not removed, reduces the crop yield. If such plants are cultivated mixed with other plants whose early growth is rapid, they prevent growth and development of weeds. Therefore, in this study it is indicated that intercropping has better control of weeds than pure crops. The maximum of weed density was obtained in M_1I_3. The minimum of weed density was obtained in M_3I_5.

Keywords:
Cropping system, Density, Weed.

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INTRODUCTION

Row cropping is one of the common forms of multi-vessel systems that is widely defined and varied in cultivating at spatial and temporal dimensions (Altieri, 1991). Mixed crop is the growth of two or more crops in one place simultaneously for easier access to light, water and food. In other words, production is maximum at the unit time and place which is associated with maximum productivity, and against which there is a single option that only one plant is cultivated in one piece of land per year and the maximum productivity is only per unit area (Plucknett and Smith, 1986). One of the main benefits of crop cultivation is increasing the efficiency of using available resources and increasing productivity towards pure crop.

Other benefits of mixing cultivation include better soil coverage, better control of weeds and reduced leaching of nutrients (Papanastasis *et al*., 2004). In addition to barley and bean mixture, increasing the percentage of bean, although the amount of barley yield decreased, but total yield increased and weeds were also effectively controlled (Agegnehu *et al*., 2006). Increasing yield in mixed cropping has been reported in many studies. The main reason for the results are the effective use of growth sources in mixed cropping and pure cropping as well as the indirect effects of mixed cropping on weed control (Banik *et al*., 2006).

Biomass production and lower weed density in mixed crop due to the complementary combination of crops in the mixture, is due to the increases in their competitive ability with weeds (Nielson *et al*., 2003). In the culture of barley and peas mixture, weed biomass was reduced to pure peas cultivation. In non-weed control conditions, the total biomass of the products in the mixture of these two plants were higher than their pure crops (Santiago, 2005). Intercropping, in contrast to conventional systems, protect soil by covering more soil surface. In the cultivation of mixed grasses with legumes, the grasses, having spider roots, make the soil structure more favorable as a conventional system, and also protect the soil by covering more soil surface and reduce water erosion. Legumes have a tendency to penetrate deep into the soil with vertical roots, so the presence of grass with a legume plays an important role in soil conservation (Gustave *et al*., 2008).

Soil erosion also decreases in crop cultivation due to the presence of more residues in the soil surface and increased land cover, improving soil physical and chemical quality and reducing surface runoff (Rajeswara, 2002). The CO_2 is fixed by the enzyme Phosphoenol Pyruvate Carboxylase (PEPCase) producing malic acid that is decarboxylated during the day, generating CO_2 that is refixed photosynthetically (Bastide *et al*., 1993). Hence, the present study was carried out to assess the efficiency of methanol and triple intercropping on the study plants.

MATRIALS AND METHODS

This research was carried out at the Research Farm of Agricultural Research Center of Zabol University located in Zahak. According to the classification of Bergh, the city of Zahak has a dry and very dry climate. Before starting the experiment, 10 samples were taken randomly from a depth of 30 cm in order to study the physical and chemical characteristics of the soil. Experiment was conducted in a split plot design based on randomized complete block design with three replications in two years. The pieces were first deeply ploughed. Then, for the crushing of the clutches, the disk was run twice perpendicularly and was created using a leveler leveler, and then by Farrower Joy and Stack.

The first factor had three levels and the second factor had nine levels. The pure planting of three plants at optimal density (between two plants in row for sour tea, peanut and aloe vera was 50, 15 and 50 cm, respectively) was done. The final density of mixed treatments for three plants were determined by changing

Table 1. Anova analysis of the weed density affected by methanol and intercropping

S. No	S.O.V	df	*Cyperus*	Other narrow leaf weeds	*Heliotropium*	Other broad-leaved weeds
1	Repeat (R)	2	151.9387	6.7964	1.5951	0.05775
2	Year (A)	1	321.79026^{ns}	4.0296^{ns}	0.86096^{ns}	0.0621^{ns}
3	R*A	2	203.8626^{ns}	4.1659^{ns}	1.7945^{ns}	0.0577^{ns}
4	Methanol (B)	2	496.0007**	4.5853*	1.4560*	0.0602*
5	Intercropping (C)	8	17226.5715**	26.9326**	38.2316**	1.0777**
6	A*B	2	354.8261^{ns}	1.7206^{ns}	0.1217^{ns}	0.0058^{ns}
7	A*C	8	134.0910^{ns}	1.3194^{ns}	0.3161^{ns}	0.0113^{ns}
8	B*C	16	4015.1174**	4.2036**	2.9967**	0.4235**
9	A*B*C	16	96.5199^{ns}	1.2661^{ns}	0.2493^{ns}	0.0093^{ns}
10	Error	104	8879.7873	1.2999	0.4992	0.0185
11	(%) C.V	-	10.96	23.45	19.47	12.49

*, **, ns: significant at P<0.05 and P<0.01 and non-significant, respectively.

the spacing of two plants per row, in the absence of any change in the distance between the rows (the distance between the two rows was fixed and 50 cm). The planting ratios with the number of experiment plots were 81 and each plot was composed of six rows of planting lengths of three meters.

All treatments were cultured in a row of peanuts and a row of sour tea and a row of aloe vera. The distance between the subplots was 1 m and the distance between the main plots was 2 m. Planting was done manually in early May on a hot line of stack water. Seeds of sour tea were grown in a clump and at a depth of 1 to 2 cm and covered with a layer of windmill sandwich to facilitate germination. Seeds of peanut were cultivated with hands at a depth of 4 cm. Sour tea was selected from the Zabul local mass. Aloe vera was used at a same size. The operations were carried out, including a voyage in the areas of non-greening land.

Irrigation droplets were sprayed onto the bushes. Spraying was performed by a pumped sprayer at the end of the day and at sunset. To measure the weed density at 40 days after planting, by removing the marginal effect from a 2 m^2 surface area per plot, 1 × 1 square meter quadrates were weeded and weed density, was calculated according to the need of plants and thinning in areas of cultivated land where two plants were grown together and from one site. Each of these values was added at a rate of 2 g/L of glycine, because the addition of glycine to methanol aqueous solution prevents methanol toxicity. Spraying was carried out 60 days after planting. The solutions were sprayed during the growing season and at intervals of 14 days. The means were compared and the statistical calculations were done using MS Excel.

RESULTS AND DISCUSSION

Cyperus density

The results of combined analysis of data showed that the effect of year, interaction of year in mixed cropping, year in methanol and triple interaction of experimental treatments did not have a significant effect on *Cyperus* density (Table 1). Effects on methanol interactions in crop cultivation were significant on *Cyperus* density (Table 1). The highest to lowest *Cyperus* density were obtained from 10% methanol + pure aloe vera, 100% sour tea + 50% peanut + 50% aloe vera and 30% methanol + aloe vera pure cultures, respectively (Table 2).

It seems that inhibition of light radiation by sour tea can be useful for controlling weed density, this

Table 2. Comparison of different traits of peanut affected by manure and intercropping

S. No	Treatments	Other broad-leaved weeds (plant/m^2)	*Heliotropium* (plant/m^2)	Other narrow leaf weeds (plant/m^2)	*Cyperus* (plant/m^2)
1	M_3I_1	1.29^{bcd}	4.58^{bcde}	5.90^{abc}	107.82^{d}
2	M_3I_2	1.30^{bcd}	4.61^{bcde}	5.94^{abc}	108.12^{d}
3	M_3I_3	1.32^{bcd}	4.63^{bcde}	6.05^{abc}	112.30^{d}
4	M_3I_4	1.16^{d}	4.18^{de}	4.56^{cdefg}	65.96^{g}
5	M_3I_5	0.50^{g}	1.17^{f}	1.93^{i}	37.88^{i}
6	M_3I_6	1.20^{cd}	4.19^{de}	5.29^{bcde}	81.14^{f}
7	M_3I_7	0.57^{fg}	1.41^{f}	3.11^{ghi}	42.39^{i}
8	M_3I_8	1.18^{d}	4.18^{de}	5.19^{bcdef}	67.36^{g}
9	M_3I_9	0.55^{fg}	1.25^{f}	2.45^{hi}	42.10^{i}
10	M_2I_1	1.32^{bcd}	4.66^{bcde}	6.06^{abc}	114.80^{d}
11	M_2I_2	1.32^{bcd}	4.68^{bcde}	6.09^{abc}	125.71^{c}
12	M_2I_3	1.34^{bcd}	5.18^{abcd}	6.10^{abc}	128.55^{bc}
13	M_2I_4	1.21^{cd}	4.36^{cde}	5.37^{bcde}	85.14^{ef}
14	M_2I_5	0.60^{fg}	1.46^{f}	3.29^{ghi}	42.51^{i}
15	M_2I_6	1.23^{bcd}	4.39^{cde}	5.54^{bcd}	91.56^{ef}
16	M_2I_7	0.69^{ef}	1.70^{f}	3.57^{gh}	43.29^{hi}
17	M_2I_8	1.22^{bcd}	4.37^{cde}	5.42^{bcde}	89.21^{ef}
18	M_2I_9	0.63^{fg}	1.50^{f}	3.37^{ghi}	43.15^{hi}
19	M_1I_1	1.40^{bc}	5.26^{abc}	6.10^{abc}	137.82^{b}
20	M_1I_2	1.41^{b}	5.56^{ab}	6.43^{ab}	139.19^{b}
21	M_1I_3	1.61^{a}	5.86^{a}	7.25^{a}	158.27^{a}
22	M_1I_4	1.24^{bcd}	4.43^{cde}	5.65^{abc}	91.59^{ef}
23	M_1I_5	0.83^{e}	1.79^{f}	3.70^{fgh}	43.33^{hi}
24	M_1I_6	1.26^{bcd}	4.57^{cde}	5.87^{abc}	106.76^{d}
25	M_1I_7	1.16^{d}	3.78^{e}	3.96^{defgh}	55.10^{h}
26	M_1I_8	1.25^{bcd}	4.55^{cde}	5.82^{abc}	95.22^{e}
27	M_1I_9	0.83^{e}	1.93^{f}	3.84^{efgh}	48.47^{hi}

Any two means not sharing a common letter differ significantly from each other at 5% probability.
M_1: 10% methanol, M_2: 20% Methanol, M_3: 30% Methanol, I_1: Pure roselle, I_2: Pure peanut, I_3: Pure aloe vera, I_4: 50% roselle + 25% peanut + 25% Aloe vera, I_5: 100% roselle + 50% peanut + 50% Aloe vera:, I_6: 40% roselle + 30% peanut + 30% Aloe vera, I_7: 100% roselle + 25% peanut + 75% Aloe vera, I_8: 60% roselle + 20% peanut + 20% Aloe vera, I_9: 100% roselle + 75% peanut + 25% Aloe vera

change in the quality and amount of light can prevent the emergence and growth of weeds, which ultimately increases the competitiveness of peanuts and aloe vera as a complementary crop in combination with weeds. In the culture of barley and peas mixture, weed biomass was reduced to pure peas cultivation. In non-weed control conditions, the total biomass of the products in the mixture of these two plants which were higher than their pure crops (Santiago, 2005).

Other narrow leaf weeds density

The results of the combined analysis of data showed that the effect of year, interaction of year in mixed cropping, year in methanol and triple interaction of experimental treatments did not have a significant effect on other narrow leaf weeds density (Table 1). Effects on methanol interactions in crop cultivation were significant on other narrow leaf weeds density (Table 1).

The highest to lowest other narrow leaf weeds

density were obtained from 10% methanol + pure aloe vera, 100% Sour Tea + 50% peanut + 50% aloe vera and 30% methanol + aloe vera pure cultures, respectively (Table 2). Biomass production and lower weed density in the mixed crop was due to the complementary combination of crops in the mixture, which increases their competitive ability with the weeds (Nielson *et al*., 2003).

***Heliotropium* density**

The results of the combined analysis of data showed that the effect of year, interaction of year in mixed cropping, year in methanol and triple interaction of experimental treatments did not have a significant effect on *Heliotropium* density (Table 1). Effects on methanol interactions in crop cultivation were significant on *Heliotropium* density (Table 1). The highest to lowest *Heliotropium* density were obtained from 10% methanol + pure aloe vera and 100% sour tea + 50% peanut + 50% aloe vera and 30% methanol + aloe vera pure cultures, respectively (Table 2). Increasing yield in mixed cropping has been reported in many studies. The main reasons for this result are the effective use of growth sources in mixed cropping and pure cropping as well as the indirect effects of mixed cropping on weed control (Banik *et al*., 2006).

Other broad-leaves weed density

The results of combined analysis of data showed that the effect of year, interaction of year in mixed cropping, year in methanol and triple interaction of experimental treatments did not have a significant effect on other broad-leafed weeds density (Table 1). Effects on methanol interactions in crop cultivation were significant on other broad-leaved weeds density (Table 1). The highest to lowest other broad-leaved weeds density were obtained from 10% methanol + pure aloe vera, 100% sour tea + 50% peanut + 50% aloe vera and 30% methanol + aloe vera pure cultures, respectively (Table 2).

One of the main benefits of crop cultivation is increasing the efficiency of using available resources and increasing productivity towards pure crop. Other benefits of mixing cultivation include better soil coverage, better control of weeds, reduced leaching and leaching of nutrients (Papanastasis *et al*., 2004).

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