Introduction of Grass Pea as a Suitable Summer Crop after Barley Harvesting in the Semi-Arid Areas

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Introduction of grass pea as a suitable summer crop after barley harvesting in the semi-arid areas

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Introduction

Forage production during summer season is a big challenge in the semi-arid dry areas. Forage crops become more important with increasing demand for meat and milk in the developing countries (Delgado, 2003). There are suitable opportunities to increase forage production without any decrease in cultivated areas under major cereal crops. Grass pea (*Lathyrus sativus* L.) and other neglected crops offer viable options for forage production. Forage crops cannot be recommended for cultivation at the expense of cereal crops which are defined as strategic crops for food security in most countries including Iran (Anonymous, 2010). Therefore, it is necessary to look for new opportunities. Cereals are dominant crops in semi-arid region and there is a short season window between the harvest of cereals in early July and planting of new crops in early October which normally is left as summer fallow in the semi-arid regions of Iran. There is generally no rainfall during July to late September in these areas (Modarres and Da Silva, 2007). It is possible to provide a little irrigation water in some areas for growing forage crops. However, selected crops should grow fast and complete the production cycle during maximum 60 days as the normal winter crops planting starts early October in these areas.

After harvesting of cereals including wheat and barley there is a considerable amount of shattered seeds which remain in the field during summer and usually are eaten away by birds or insects (Lamei *et al.*, 2011). The rate of shattering is generally high depending on harvesting method and machinery, however, it is believed that there is a minimum 5% shattering in barley and wheat (Lamei *et al*., 2011). Barley production rate is around 3000 kg/ha under irrigated conditions in semi-arid areas and its 5% shattering (150 kg/ha) is optimum seeding rate for barley in these areas. It sounds that planting a suitable crop just after harvesting of cereals could alleviate the already shattered seeds to produce a mixed cropping. Mixed cropping of cereals with forage legumes can improve both quantity (Mpairwe *et al*., 2003) and quality of fodder over a pure cereal crop (Ghosh, 2004). Considerable variation has been reported in forage yields of improved vetches (*Vicia spp*.) and grass pea (*Lathyrus spp*.) under semi-arid conditions (Alizadeh and Shiv, 2013). Grass pea can grow successfully and complete flowering during 50-60 days which fits summer fallow, perfectly. Planting of grass pea with minimum tillage just after harvesting the cereals using a few irrigations can lead a mixture of cereals and legumes in order to enhance forage production. The objective of the present work was to evaluate pure stands along with mixtures of already shattered barley seeds with a local variety of grass pea at three seeding rates immediate after the barley harvest.

Materials and Methods

The experiment was carried out involving seven treatments in a randomized complete block design with three replications at Malekan Agricultural Research Station in the Northwest Iran in the summer season of 2010. Experimental field was prepared by chisel and 40 kg/ha N and20 kg/ha P_2O_5 were applied uniformly to the soil just after the barley (cv. Makoii) harvest in the mid July 2010. The seven treatments comprised of 4 pure stands including pure barley (B), pure grass pea at 150 seeds/m² (G150), pure grass pea at 200 seeds/m² (G200) and pure grass pea at 250 seeds/m² (G250) along with 3 mixed including B+G150, B+G200 and B+G250. Plot size was 10 m^2. Seeds of grass pea (cv. Naghadeh local) were planted and irrigated immediately. Pure stands of grass pea were created by eliminating of germinated barley and other weeds. Hay was harvested when grass pea initiated pod formation, which coincided with the milky stage of barley. Samples from a randomly selected 1 m^2 area of each plot were cut to the ground level. Sub-samples (0.3 kg biomass from each plot) were dried at 70°C for 48 h for quality analysis.

Results and Discussion

The analysis of variances showed significant ($P< 0.01$) differences among treatments for fresh biomass production, and calcium and fiber contents. The crop was harvested in mid-September so as to have enough turn over time for land

preparation for the subsequent winter crop. This guaranteed that there is no time interaction between grass pea and the major winter crops which is a limiting factor in the introduction of grass pea as suitable crop for this purpose.

Little information has been available regarding grass pea and its capacity for mixing with barley in order to forage production during summer season. The results showed its potential for producing a recognizable biomass during summer in the north-west Iran. The Northwest of Iran is clustered as semi arid region and is known with its short spring and dry summer (Anonymous, 2010). This study showed a variation for forage production potential among the different mixtures of grass pea with barley. The highest fresh biomass (45.3 ton/ha) was obtained in the mixture of barley with grass pea at 200 seeds/m² (Figure 1) which is 50% more than pure barley yield (Figure 1).

The highest fiber content (Figure 2) and relatively low ash content (12.6%) was achieved in the mixture of barley with grass pea at 200 seeds/m² (Figure 2). High fiber content in the bi-cultures meant low feeding value in these treatments comparing pure grass pea. However, mineral contents were higher in the bi-cultures comparing with pure stands of grass pea as reflected in the higher ash contents (Figure 2). The calcium percent in the mixture of barley with grass pea at 200 seeds/m² was not significantly different from pure grass pea stands (Figure 2). This means that we can produce much forage with high quality using suitable seed density of grass pea.

Table 1.Analysis of variance on some studied characteristics in different mixtures of grass pea with barley

SV	DF	MS						
		Fresh biomass		Plant height		Calcium %	Fiber %	Ash %
Block	2	116.37		23.84**		0.003*	0.035	0.001
Treatment	6	126.67*		108.09**		0.02**	3.47**	4.96**
Error	12	42.47		3.66		0.0001	0.064	0.026

** and * are significant at 1% and 5% probability level, respectively

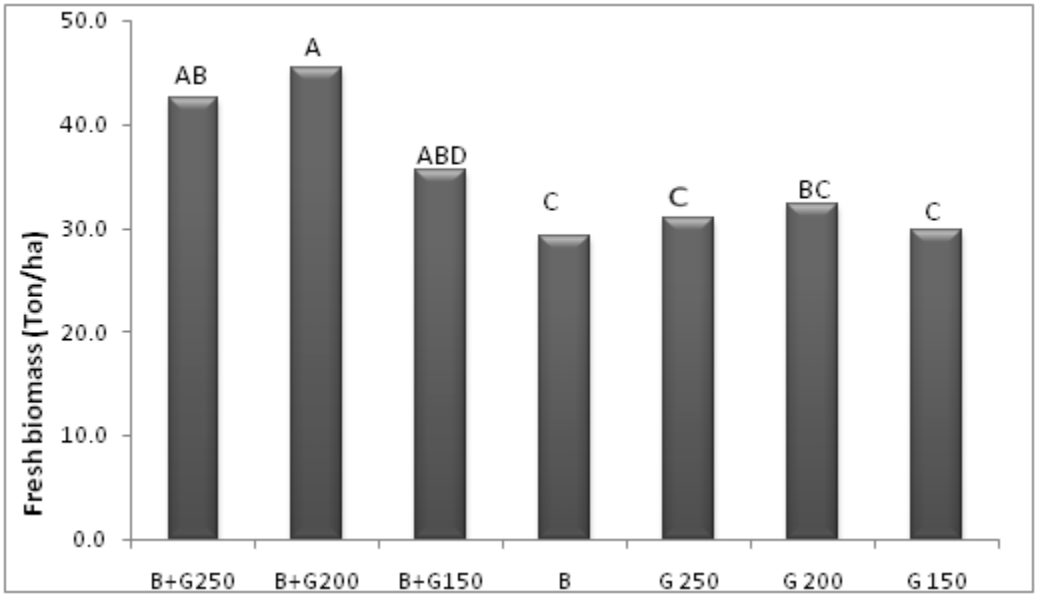

Fig 1. Mean fresh biomass production (Ton per hectare) over pure stands and different mixtures of grass pea (G) with barley (B).

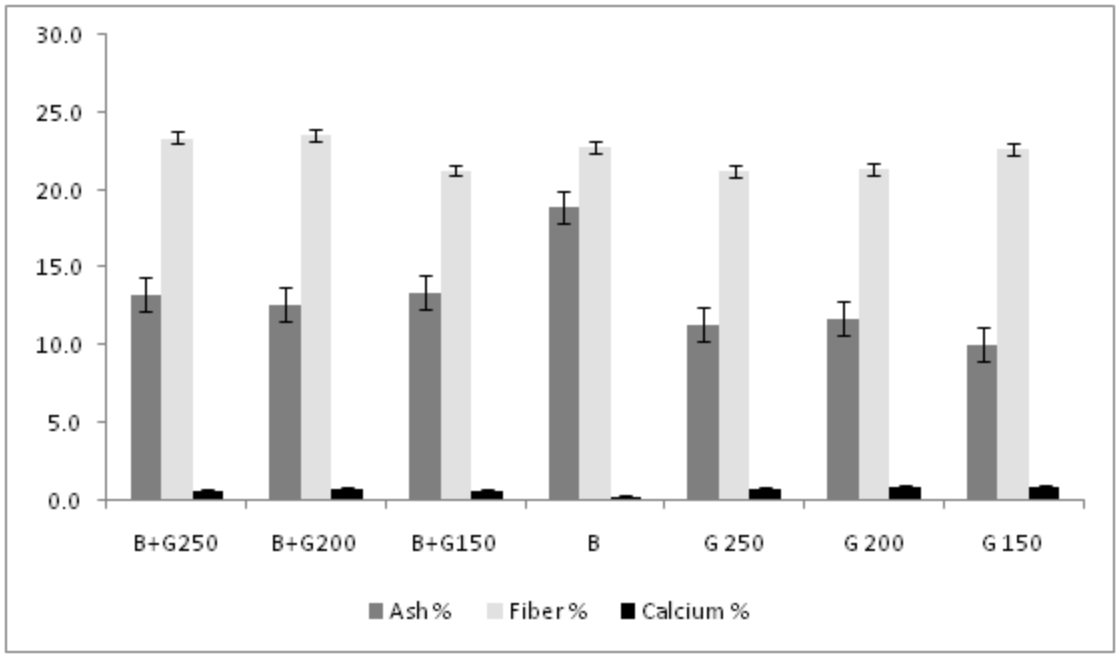

Fig 2. Mean Ash, Fiber and Calcium percent over pure stands and different mixtures of grass pea (G) with barley (B).

Conclusion

It was concluded that immediate after the barley harvest, cultivation of grass pea at 200 seeds/m²can produce recognizable forage crop in the semi-arid regions. It is a remunerative alternative for summer fallow and is especially recommended in those regions where farmers cannot produce enough forage during summer season. Controlling of summer weeds, recycling of the cereal grains falls and enhancing the soil fertility using grass pea as a summer crop are planned for further research.

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