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Determination of the Best Time of Sampling for Evaluation of Seed Bank Relation with Weed Density in Sugar Beet Using Regression Analysis

Naser Akbari*
Agriculture College, Lorestan University, Iran
*E-mail: Rroham62@yahoo.com

Abstract

Based on regression analysis and in order to specify the relationship between the population of the seed bank and the weed population in sugar beet farm, a study was conducted in the year 2009 in Motahari research center in Kamalshar (Karaj). The sampling from the seed bank was taken before planting the sugar beet as well as the weeds. The sampling from weeds was taken in three phases in two different sizes (50 × 50 cm) and (100 × 25 cm). In each piece of land, the population of the seeds of weeds and density of the bushes were separately identified and registered. Based on findings, the highest amount of weeds was related to amaranth weed. The first sampling pointed out the highest amount of weeds as well as the highest co-efficiency with seed bank of amaranth weed. The regression analysis found out that there exists a higher co-efficiency in this phase of sampling in comparison with the whole three samplings. Hence, the first phase of growing which is so important based on controlling the weeds as well as critical period can be used to predict the population of weeds according to their seed density in seed bank.

Keywords: Seed bank, sugar beet, time of sampling, weed population

Introduction

Weeds are in competition with sugar beet for more sunlight, minerals, water and the space. They also prevent sugar beet growth up to 33 to 50 percent. There exist about 250 types of weeds in the world which 60 of which are seen in most of the sugar beet farms which weeds and amaranth weed are the two common ones (Ganbari ,birghani et al 1002). Soil acts like a bank which the process of depositing and drawing the seeds are continuously taking place in it. While by continuous seed entrance to the soil, great deal of them are out of the cycle through death, decomposition, and growing (Douglas, 1995). The relationship between parts of seed bank can be specified through combination of weed types and its growing time during the season. Furthermore, specifying the amount of pollution is also possible through seed bank use which is the agent of weed population in the farm. Moreover, there exists about 3 up to 7% of co-efficiency between seed bank and annual population of weeds. A prediction of seed population of weeds in soil can be used to estimate the time of growing, the density of weeds as well as weed controlling and management (Forcella, 1998). Successful implementation of mixed methods of weed management requires an exact understanding of the combination and the density of invader–type of weeds which is controlled by seed bank characteristic of weed in soil (Buhler, 2002). Weed management aims at changing the relationship between farmed plants and the weeds to the benefit of the farmed plants. Some achievements in this regard are the prevention of weed growth as well as prevention in their growing organs. In this regard, predicting the growing time of the weeds and their place is being the other achievement. The best solution in achieving such a knowledge is to study the relationship between weed seed bank and population of the weeds which by conducting the current study in sugar beet farm of Karaj, the most suitable time of sampling of weeds in sugar beet farm is specified through using regression analysis in order to be used for mixed and ecological management of weeds.

Methodology

This study was conducted in the year 2009 in research center of Motahari which is located in Karaj, Kamalshar ,in the west bank of Ghezelhesar Road with geographical length of 51 degree and 60 min east and width of 35 degree and 59 min north, 1300 meter above sea level and 243 millimeter of rain drop annually. After the final preparation of the field, the field was divided into four parts (4 × 8 meters). The intersections were specified and all samplings were taken from these spots till the end of the season. Soil sampling was done prior to planting of sugar beet in order to study the seed bank. The bush density of weeds was done after sugar beet growth in three phases. In sampling spots and from each five mixed samples, soil was taken from zero to ten cm depth. The samples were later mixed and washed. They were also counted and identified through using two eye stereo microscopes. Sampling for population was also done from the same mentioned spots. All weeds which were grown nearby were identified, counted and also cut. The seeds were planted in April 2009 and weed removal was done in June 2009, catalyzer was done in July 2009 respectively. Finally, the best relationship between seed bank and weed density was analyzed through using computer software.

Results and discussion

Studying the relationship between seed bank and weed population showed that most of the weeds which were identified during farming period are the ones which were identified in seed bank. The highest density of weeds was related to amaranth weed. Findings also showed that increasing the seeds of amaranth weed in seed bank, increases the density of amaranth weed during growth period of sugar beet as well. Calculating the regression co-efficient between seed bank of amaranth weed and the population of grown amaranth weed during the farming period have shown that the relationship between seed bank and field's weed is significant (r2=%67) and has linear relationship as well (table 1). Regression co-efficient of seeds of amaranth weed in seed bank and the population of grown weed was more than other types. The comparison made between findings of regression analysis between seed bank of weeds before planting sugar beet with the population of amaranth weed in the first phase of density change (table 2) and the findings of bush density in three phases showed that in the first sampling, there existed a higher co-efficiency in comparison with all three phases, so this relationship was also significant (r2=%70) (figure 1). Therefore, the first phase of growth in terms of weed control and based on critical period is of a high importance and can be used to predict the population of weeds based on seed density in seed bank.

Generally, through specifying the density and mixture of seed bank types, the weed population and the mixture as well as the density of weed population can be predicted at the beginning of the season. Therefore, knowing this fact can give us the opportunity to choose the best time as well as the suitable way in our management in order to reduce the density of weed seed in seed bank. There are always different types of weeds in the field and knowing the right time in which there exist the highest density of weeds is an important issue, since through knowing this fact the farmers can start fighting against weeds effectively. Furthermore, a scientific achievement to logical number of sampling which is trustworthy both in terms of prediction and accuracy is useful.

As mentioned earlier the first sampling showed the highest amount of weed population as well as the highest co-efficiency with seed bank of weeds. In later samplings, the weed population showed a lower density and the co-efficiency of later phases decreased as well. In weed management, the growing period is of a high importance in plant life, since it is the earliest and the easiest period for mechanical and chemical control. As this period is of a high importance, all scientists have tried to develop ways in order to control weeds in this period (Cardina and Sparrow,

1996) which is the first phase of sampling in this study. The findings of Gholami Gholaf Shan et al (2009), Ashrafi et al (2003) and Cardina and Sparrow (1996) are also in line with findings of the current study. This study claims that through knowing the density of weed seed in the field ,we can somewhat estimate the density of weed population during the farming season which it gives us the best time and the most suitable method in right management and reduction of weed seed in seed bank. Calculating the co-efficiency between seed bank of weed and thinner weed with population of weeds during the farming season shows that a relationship between seed bank and weeds is significant: r2=%51 and r2= %84 (table 3 and 4).

Table 1: Regression analysis (linear) in order to specify the relationship between seed bank and the population of amaranth weed in growing season

Changes source	Df	Variance	Coefficient
Linear relationship	1	60249778290/3 **	0/67 **
error	42	851788828/6	
total	43		

Table 2: Regression analysis (Quadratic) in order to specify the relationship between seed bank and the population of amaranth weed weed in the first phase of sampling

Changes source	df	Variance	Coefficient	Width from the destination(b0)	Regression coefficient(b1)	Regression coefficient(b2)
2nd type crump	2	28749146778/6 **	0/70 **	20458	243/47	-0/12
error	41	939673549/6				
total	43					

Table 3: Regression analysis (Quadratic) in order to specify the relationship between seed bank and the population of weed in the first phase of sampling

Changes source	Df	variance	Coefficient	Width from the destination(b0)	Regression coefficient(b1)	Regression coefficient(b2)
2nd type crump	2	399040382/6 **	0/51 **	2753/77	665/28	- 6/83
Error	41	18141600				
Total	43					

Table 4: Regression analysis (Quadratic) in order to specify the relationship between seed bank and the population of thinner weed in the first phase of sampling

Changes source	Df	variance	Coefficient	Width from the destination(b0)	Regression coefficient(b1)	Regression coefficient(b2)
2nd type crump	2	10778169150 **	0/84 **	5056/99	133/75	- 0/02
Error	41	94485651/2				
Total	43					

** shows the significance in level of 0/01

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