

Effects of maize-soybean cultivars as replacement series in intercropping on yield and land equivalent ratio

Salma Kalantari Khandani¹, Alireza Koocheki², Mehdi Nassiri Mahallati²

1. PhD. Student, Agrotechnology Department, Faculty of Agriculture, Ferdowsi University of Mashhad (Corresponding author)
2. Professor, Agrotechnology Department, Faculty of Agriculture, Ferdowsi University of Mashhad

Received: April 2018 Accepted: September 2018

Extended Abstract

Kalantari Khandani, S., Koocheki, A., Nassiri Mahallati, M., Effects of maize-soybean cultivars as replacement series in intercropping on yield and land equivalent ratio
Applied Research in Field Crops Vol 31, No. 2, 2018 4-6: 21-45(in Persian)

Introduction: Intercropping, growing two or more crop types or cultivars on one field, is considered as one of the most important agricultural operations that can improve the utilization of environmental resources through increased plant growth and yield. Diversity and stability of fields, reduction in chemical fertilizers application and nutrient availability such as biological nitrogen fixation, are considered as some of the benefits of intercropping. Hence, selection of legume cultivars in intercrops is important and should be taken into account. Also different intercropping patterns can improve biodiversity at species level (Monti *et al.*, 2016). *Maize is a crop that can be included in intercropping systems with various plants due to its high adaptability (Nassiri Mahallati et al., 2010). Soybean, due to its symbiotic relationship with Rhizobium japonicum bacteria and its nitrogen-fixing capability, can be particularly considered for intercropping systems (Nyoki & Ndakidemi, 2018). Therefore, intercropping mixtures of maize and soybean cultivars could be a suitable option to increase land use efficiency. The aim of this study was to investigate changes in yield, yield components and land equivalent ratio in maize and soybean mixed cropping based on replacement series under Mashhad climatic condition.*

Materials and Methods: The experiment was laid out as split-plot arrangement based on a randomized complete block design with four replications at research farm of agriculture college, Ferdowsi University of Mashhad, Iran during 2013-2014 growing season. The main factor consisted of mixed culture of Williams and Sahar soybean cultivars with Ns640 and Osk713 maize cultivars and the sub factor comprised of intercropping row ratios of 100 % maize - 0 % soybean, 75 % maize - 25 % soybean, 50 % maize - 50 % soybean, 25 % maize - 75 % soybean, and 0 % maize - 100 % soybean, which had been designed based on the replacement series. Prior to determining grain and biological yields, 10 plants from the middle rows of each plot, leaving out the border rows, were randomly selected and then were used to measure some yield components of soybean (number of pods per plant and 1000-seed weight) and maize (number of rows per ear and 1000-seed weight). Before conducting combined analysis, error variance values across two years of the experiment was tested and the combined analysis of the traits was performed after ascertaining the homogeneity of the error variance. Thus, the data related to land equivalent ratio were subjected to combined analysis and the other data were separately analyzed. The Duncan Multiple Range Test (DMRT) at 5% probability level was used to compare the means of treatments

Results and Discussion: The results showed that mixed cropping combinations, ratio of maize and soybean cultivars in mixture and the interaction of combinations of intercrops and cultivars ratio significantly affected the number of rows per ear, 1000-seed weight, grain yield, biological yield and harvest index. During the 2013 and 2014 growing seasons, increasing the soybean ratio in intercrops led to a significant increase in 1000-seed weight of this plant.

Maize and soybean grain and biological yields were higher in their sole cropping than in the treatments involving the mixture of the cultivars of two crops. However, there was a drop in grain and biological yields of the crops as the proportion of each of the maize and soybean cultivars in the mixture decreased. The maize cv. Osk713 and soybean cv. Sahar had higher grain and biological yields among the various treatment combinations because of longer growing period. Between soybean cultivars, Williams has higher nitrogen, protein and crude fiber content as compared to Sahar cultivar. Maize and soybean harvest index in their sole cropping was more than the mixed cropping treatments. Also, during the both growing seasons, the highest protein content was obtained in 50 % maize - 50 % soybean treatment. Harvest index for both maize and soybean crops was higher in sole cropping than in intercropping. The highest total land equivalent ratio of 1.68 (maize + soybean) was recorded in 25% maize cv. Ns640 + 75% soybean cv. Sahar. The results of current experiment can emphasize the positive

aspects of maize-soybean intercropping in terms of increasing the utilization of environmental resources per cultivated area.

Keywords: Sowing ratio, Cultivars composition, Fiber percentage, Protein percentage.

References

- Monti, M., Pellicanò, A., Santonoceto, C., Preiti, G., and Prišteri A. 2016. Yield components and nitrogen use in cereal-pea intercrops in Mediterranean environment. *Field Crops Research*, 196: 379-388.
- Nassiri Mahallati, M., Koocheki, A., and Jahan, M. 2010. Radiation absorption and use efficiency in relay intercropping and double cropping of winter wheat and maize. *Iranian Journal of Field Crops Research*, 8: 878-890. (In Persian with English Summary).
- Nyoki, D., and Ndakidemi, P.A. 2018. Rhizobium inoculation reduces P and K fertilization requirement in corn-soybean intercropping. *Rhizosphere*, 5: 51-56.