Using DSSAT model to simulate the affects of climate change on grain yield of some maize cultivars in response to growth and different levels of nitrogen fertilizer

Abstract

This research was carried out to investigate the climate change on yield and crop characteristics in three hybrids of single crop corn with different periods (early 260, midrange 500 and late 704), four levels of nitrogen (0, 80, 160 and 240 kg nitrogen per hectare). The source of urea was carried out in Isfahan and Zabol in 2014 and 2015 respectively. The experiment was a split plot design in a randomized complete block design with three replications. The results of this study showed that, under the interaction of × hybrid × nitrogen fertilizer, traits such as number of seeds per ear, 1000 grain weight, grain yield and harvest index were significant at 1% level. Number of seeds per row, number of rows per ear, ear length, stem diameter, plant height, grain protein and biological yield were significantly affected by interaction of nitrogen and hybrid at 1% level. According to the comparison of averages, increasing nitrogen levels increased from 80 to 240 kg nitrogen fertilizer per hectare, ear length, plant height, stem diameter, 1000 grain weight, spad, grain protein and biological yield. Increasing nitrogen from 80 to 160 kg nitrogen fertilizer per hectare increased the number of grain per ear and grain yield. Limit of nitrogen application for 50% of performance loss in Zabol and Isfahan regions for hybrid 704 was 200 and 178, for hybrid 500, respectively, 192 and 164 respectively, and for 260 hybrids, respectively, 186 and 150 kg / ha, respectively. Under the interaction of location × hybrid × nitrogen fertilizer, traits such as nitrogen absorption index, nitrogen consumption index, nitrogen productivity index, nitrogen removal index were significant at 1% level. According to the comparison of the meanings, with increasing nitrogen levels from 80 to 240 kg nitrogen fertilizer per hectare, the adsorption, consumption, yield and nitrogen removal index decreased. By increasing nitrogen fertilizer, the biological yield increased. Also, physiological parameters such as leaf area index, plant growth rate and relative growth rate were affected by nitrogen fertilizer. Increasing nitrogen fertilizer from 80 to 240 kg nitrogen fertilizer per hectare

increased the leaf area index, plant growth rate and relative growth rate from 35 days after planting, which was significant after fertility. Among the physiological growth indices, the net absorption rate was lower by nitrogen fertilizer. The CERES-Maize model is very good in simulating leaf area index, grain yield and biological yield. The number of days from planting to flowering, physiological examination and grain yield of corn in all treatments and in two general circulation models in the years 1406, 1416 and 1426 and in all RCPs decreased. The highest grain yield predicted by HADGEM2-ES and GISS-E2-R models in Zabol was applied to the SC500 hybrid, 160 kg N ha-1 with RCP=2.6, and in Zabol, SC704 hybrid, 160 kg N ha-1 treatment with RCP=2.6 Belonged. The lowest grain yield predicted by HADGEM2-ES and GISS-E2-R models in Zabol was applied to the SC260 hybrid SC260 control with RCP =8.5 and in Isfahan to SC500 hybrid control with RCP =8.5 This experiment can be used to improve the production of corn along with increased fertilizer efficiency in similar climatic conditions.

Key words: Climate change, Nitrogen efficiency, Maturity group, Corn

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