Climate change impacts on *Brachiaria brizantha* yield in São Paulo state, Brazil

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In 2007 the Intergovernmental Panel on Climate Change (IPCC) presented data showing climate changes in last decades, mainly temperature increase. This change has worried scientists about the future. Consequently, studies have been made to evaluate possible impacts of future climate changes on agricultural production. The pastures in Brazil can be especially affected, because they occupy large areas and in many places they are in marginal areas, which can be more vulnerable to climatic oscillations. In São Paulo state these changes can be important for palisadegrass (*B. brizantha* cv. Marandu), present in 7.19 million of hectares. Therefore, this research evaluated the impacts of climate change on palisadegrass yield in São Paulo state. Projections were created based on downscaled outputs of two general circulation models (PRECIS and ETA-CPTEC) considering the IPCC gases emissions scenarios A2 (high) and B2 (low). The data obtained from 23 weather stations (12 inside São Paulo and 11 in adjacent areas) in period of 1963 to 2009 was considered as current climate (base line) and the simulated periods were 2013 to 2040 and 2043 to 2070. To associate the climate with palisadegrass growth, was used the following empirical crop model: DMAR = 15.34 * $DD_{adjusted}$ ($p = 0.056$, $r^2 = 0.95$), extracted from research conducted in São Carlos – SP published in 2011, where DMAR is dry matter accumulation rate; $DD_{adjusted}$ is degree days, calculated with 17.2°C of base temperature and adjusted by one drought attenuation factor. The drought attenuation factor was obtained by the ratio actual/maximum soil water storage, considering three soils water storage capacities: 40, 60 and 100 mm. The projections showed future increase of annual forage accumulation in São Paulo state. Considering the base line data, the average annual accumulation (AAA) was 18.4, 19.6 and 21.0 Mg DM ha^{-1} $year^{-1}$ on soils with 40, 60 and 100 mm of water storage capacity, respectively. On the other hands, PRECIS model output, considering A2 scenario in period of 2043 to 2070, the AAA was 26.3, 27.9 and 29.8 Mg DM ha^{-1} $year^{-1}$, representing increase about 42%. In the same conditions, the results for ETA-CPTEC model were 25.0, 26.6 and 28.7 Mg DM ha^{-1} $year^{-1}$, representing increase about 36%. The other projections also show increase in AAA, especially in 2043 to 2070 period and B2 scenario. Although the projections show yield increase, they show variation increasing between seasons (seasonality) and years. The increase in DMAR will be more in rainy than dry season, especially in soils with low water storage capacity (40 mm) (more evidenced by ETA-CPTEC model). For these soils, minimum and maximum DMAR (kg DM ha^{-1} day^{-1}) was respectively 15.4 (winter) and 94.6 (summer) considering base line, 22.9 (winter) and 125.1 (summer) considering PRECIS model (A2 for 2043 to 2070) and 18.2 (winter) and 125.9 (summer) considering ETA model in the same scenario. These results are due increase in temperature in all long year and decrease in water availability in winter and spring, due to higher evapotranspiration and not necessarily decrease in rain. Strategies for mitigation of impacts should aim ways for the use of summer forage surplus, and to reduce effects of less water availability.

Keywords: crop model, ETA-CPTEC, livestock, palisadegrass, PRECIS, tropical pasture

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