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USING PRINCIPAL COMPONENT ANALYSIS TO EVALUATE SOYBEAN DROUGHT TOLERANCE

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Water availability is essential for plant development and crop yield, and is related to environmental and climatic factors. Principal component analysis (PCA) and a Biplot graph were used to jointly interpret the relationship between variables and treatments. Several measurements were performed to evaluate the effect of drought stress in conventional and RR (Roundup Ready) cultivars. The trial was carried out at Embrapa Soybean, Londrina, PR (Brazil), in a RBD with split-plots (main plots, SR = stress in the reproductive phase; I = irrigated; NI = non-irrigated; and subplots using soybean cultivars BR 16, Embrapa 48, BRS 133, BRS 134, BRS 183, BRS 184, BRS 214, BRS 232, BRS 245RR, and BRS 247RR). The variables were fresh weight of shoots in R5 (FWSR5) (g); FWSH, fresh weight of shoots at harvest (g); dry weight of leaves in R5 (DWLR5) (g); DWSPR5, dry weight of stems + petioles in R5 (g); DWSPH, dry weight of stems + petioles at harvest (g); DWPSR5, dry weight of pods with seeds in R5 (g); DWPSH, dry weight of pods with seeds at harvest (g); DWSR5, dry weight of shoots in R5 (g); DWSH, dry weight shoots at harvest (g); DWS, dry weight of seeds (g); SN, number of seeds (n); DWHSH dry weight of 100 seeds at harvest (g); YIELD, yield (kg/ha); CER, carbon exchange rate (µmol CO_2 $m^{-2}s^{-1}$); SR, stomatal resistance ($s.cm^{-1}$); ICO2, internal [CO_2] (ppm); RWC, relative water content (%); OILC, oil content in the grain (%); PC, protein content in the grain (%) and DIFTEMP difference air temperature-leaf temperature (^oC). The five components expressed 88.5% of the explained variance and cluster analysis was done to group treatments into nine groups. The variable DWPSH contributed positively to the treatments BR 16, BRS 183, BRS 232, either under I and NI conditions in the quadrants Q1 and Q4. The DWPSR5 is associated with the treatments BRS 134 and BRS 184 under NI conditions and to BRS 133 irrigated. Non-irrigated BRS 133 is positively associated with the variables DIFTEM, RWC, YIELD and CER (Q1). Less responsive cultivars are in the Q2/Q3 under drought stress in the reproductive phase (R5). For this treatment the contributing variables were: PC, ICO2, SR, OILC, with the exception of FWSR5 which gave little contribution. Cultivars BRS 245RR and BRS 247RR in I and NI treatments presented higher yields and the associated variables were DWS, DWPSH, FWSH, SN at harvest, DWLR5 and DWSPR5 in R5. The cultivars BRS 232, BRS 133 and BRS 184 in I and NI treatments also presented higher yields. With PCA and Biplot it was possible to detect variables which are associated with cultivars and their sensitivity or tolerance to drought stress.