Título: EFECTO DE LA INTERACCION ENTRE CO2 ELEVADO TEMPERATURA Y SEQUIA DURANTE EL REBROTE DE PLANTAS DE ALFALFA NODULADAS

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Resumen: The rising atmospheric C02 concentration resulting from industrial development may enhance photosynthesis and plant growth. However, there is a lack of information concerning the combined effect of factors such as C02, temperature and water availability on plant regrowth following cutting or grazing, the usual managing methods of forage legumes like alfalfa. Elevated C02, temperature and drought can interact with cutting factors (e.g. cutting frequency or height), and source-sink balance differences before and after defoliation can modify photosynthetic behaviour and biomass accumulation, as well as biomass partitioning between above- and below ground organs. Furthermore, the equilibrium between production of reactive oxygen species (ROS) and their scavenging may be altered during the regrowth, an intense phase of growth. The aim of our study was to determine the interactive effect of C02 (ambient, around 350 umol mol-1 vs 700 umol mol-1), temperature (ambient vs ambient + 4°C) and water availability (weil-irrigated vs partially irrigated) on dry matter partitioning, photosynthesis, taproot N accumulation and antioxidant status in nodulated alfalfa after vegetative normal growth and during regrowth. At the end of vegetative normal growth, C02 enhanced dry matter accumulation despite photosynthesis being down-regulated (lower photosynthetic rates, vcmax and rubisco activity). This decay was probably a consequence of a specific rubisco protein reduction and/or inactivation. However, during the regrowth period, photosynthesis was stimulated by elevated C02 and resulted in greater biomass

accumulation. This absence of photosynthetic acclimation was directly associated with the new source-sink status of the plants during regrowth. After cutting, higher root/shoot ratio and remaining organs respiration can act as a strong sink for photosynthates, avoiding leaf sugar accumulation (the negative feed-back control of photosynthesis), and as a consequence, photosynthetic down-regulation. Above ground organs were more affected by drought than below ground ones during the entire experiment, particularly during Vegetative normal growth. The higher drought tolerance (greater growth) observed during the regrowth period may be related to higher mass and greater reserves accumulated in the roots. it has been demonstrated that nitrogen pools in alfalfa taproot, especially vegetative storage proteins (VSP), condition new regrowing shoots. The taproot VSP concentration was increased by drought during this period, and this increase explains the reduced production differences between control and drought plants at the end of cutting/regrowth cycle. After one month of regrowth, drought increased the VSP leve! again and confirmed an expectation of greater forage production in drought treatments under equal regrowth conditions during the next cutting-regrowth cycle. At the end of the first regrowth period, elevated C02 reduced cnlorophyll content and no differences were observed in superoxide dismutase (SOD) or glutathione reducíase (GR). However, increased catalase (CAT) and ascorbate peroxidase (APX) activi ti es were obtained associated with the higher plant growth in those treatments. During the last regrowth period, elevated C02 decreased chlorophyll content as well as CAT, SOD, GR and APX activities in droughted plants. Results agree with the hypothesis that under high C02, the basal rate of oxygen activation and ROS formation is reduced leading to a relaxation of the antioxidant system.%&/