

## Effect of water stress and rehydration on the physiological and biochemical indices of alfalfa

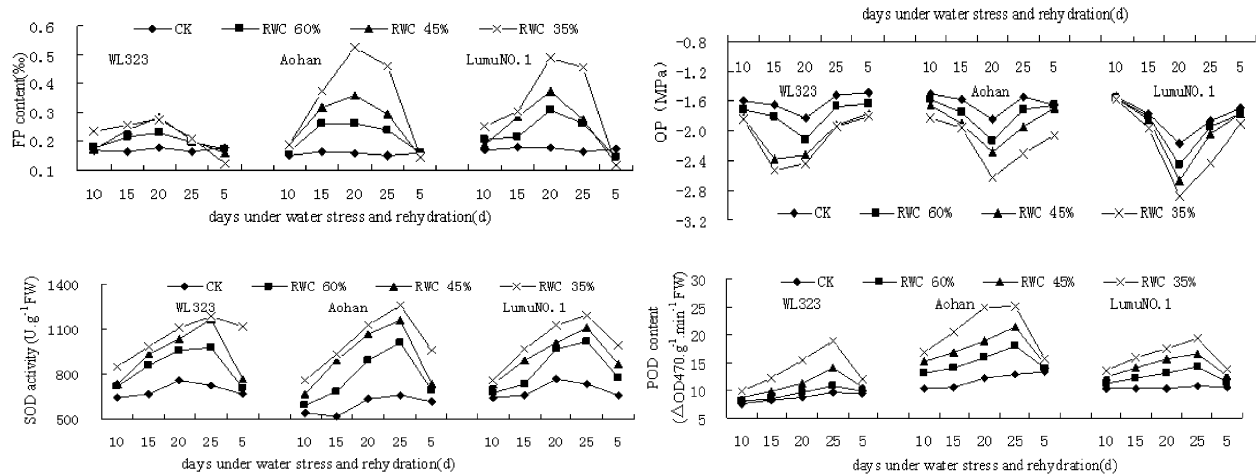
SHENGY B , WANG G L , JIA CH L , CHEN SH Y , YANG Q L , WU B  
Shandong Institute of Agricultural Sustainable Development , Jinan , Shandong , 250100 , China  
E-mail : shengyib@hotmail.com

**Key words :** water stress ; physiological and biochemical characters ; *Medicago sativa*

**Introduction** Alfalfa (*Medicago sativa* L . ) , which has high adaptability , a well developed root system , and high yields , is often called " the king of forage crops " ( Bai *et al .* , 2003 ) . The goal of this study was to gain insight into the physiological and biochemical responses of alfalfa to prolonged water deficit and rehydration .

**Materials and methods** Three varieties of alfalfa , WL323 , Aohan , and Lumu NO . 1 , were planted in plastic pots ( made from 32 cm lengths of 25 cm diameter plastic ) . The percentage of relative water content ( RWC ) of soil in pots was maintained at 75% ( the control ) , 60% ( light water stress ) , 45% ( moderate water stress ) and 35% ( heavy water stress ) . Treatments were replicated three times . Plants were grown in stress for 25 days and then rehydrated . Plants were sampled once after five days of rehydration . Free proline , osmotic potential , SOD and POD activity of alfalfa leaves were measured ( Li , *et al .* , 2000 ) .

**Results** The content of proline in three alfalfa varieties increased at the beginning , and then decreased after a maximum on the 20th day of water stress . The rates of change of proline content in Aohan and Lumu NO . 1 alfalfa were greater than WL323 . Content of proline decreased after 5 days rehydration . The osmotic potential of three alfalfa varieties decreased with the increase in water stress , but increased after 25 days of stress . After rehydration , OP in all the treatments recovered well except for WL323 and Aohan alfalfa with heavy treatment . SOD and POD activity in three alfalfa varieties changed similarly increasing with increasing water stress . With stress , SOD activity increased gradually and was maximum on the 25th day . The rate of change of POD activity in Aohan alfalfa was greater than others , and WL323 was the least , and Lumu NO . 1 was intermediate . SOD and POD activity decreased after rehydration ( Figure 1 ) .



**Figure 1** Effect of water stress and rehydration on free proline , osmotic potential , SOD and POD activity in alfalfa leaves .

**Conclusions** Data in this study show the differential antioxidative responses among three alfalfa varieties , which had high levels of an antioxidative enzyme system and free proline accumulation . In conclusion , selection of alfalfa varieties with genetic traits like antioxidants and proline accumulation might be useful in assessing the adaptive responses of alfalfa to water stress .

### References

- Bai W . M . , Li L . H ( 2003 ) . Effect of irrigation methods and quota on root water uptake and biomass of alfalfa in the Wulanbuhe sandy region of China . *Agricultural Water Management* , 62 , 139-148 .  
Li G . Q . , Du W . J . , Kong Z . S ( 2000 ) . Studies on physiological drought resistance of different soybean varieties . *Journal of Shanxi Agricultural University* , 20(3) , 197-200 .