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Changes in content of endogenous hormones in alfalfa leaf under different water stress

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Key words: alfalfa, water stress, endogenous hormones (EHs)

Introduction The study on the different content of hormones and change dynamics of the ratio of hormones under water stress is of great significance to reveal the drought resistance mechanism of the plant (Davies *et al.*, 1986). With ELISA method, the object of this study is the main hormones ABA, IAA, GA₃ and ZR in the plant under different water stress.

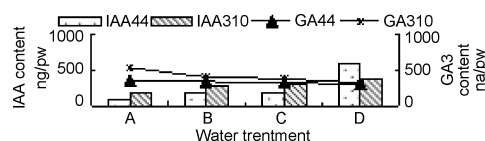


Figure 1 The change of IAA, GA₃ content under water stress.

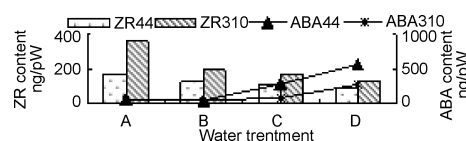


Figure 2 The change of ZR, ABA content under water stress.

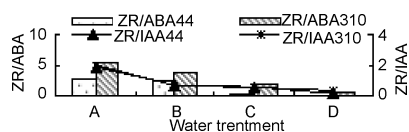


Figure 3 The change of ZR/ABA, ZR/IAA under water stress.

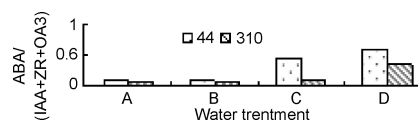


Figure 4 The change of ABA/(IAA + ZR + GA₃) under water stress.

Materials and methods Alfalfa materials for test are Argentina germplasm (ZXY04P-44) with strong drought resistance and Libya germplasm (ZXY04P-310) with weak drought resistance, both grown in pot. The test involves four soil water (SW) treatments repeated for thrice. Treatment A (normal water supply), SW :75% ~80%; Treatment B (mild water stress), SW :65% ~70%; Treatment C (moderate water stress), SW :55% ~60%; Treatment D (severe water stress), SW :40% ~45%.

Results and analysis Under Treatment A, the content of EHs in ZXY04P-44 IAA decreased, the increase of EHs in ZXY04P-44 is 1.66 times more than that in ZXY04P-310. Among the treatments, the changes are not significant ($P > 0.05$), compared with Treatment A, the water stress increased significantly ($P < 0.05$). The content of ZR in ZXY04P-44 under Treatment D decreased by 46.26%, the difference is not much compared with the decrease of the content of ZR by 46.33% in ZXY04P-310 under mild water stress, while the decrease is 64.69% in ZXY04P-310 under Treatment D. The variation of ZR/ABA in ZXY04P-44 under Treatment B is not significant ($P > 0.05$), while the variation in ZXY04P-310 among the treatments is significant ($P < 0.05$), the value of ZR/ABA under severe water stress is 0.46. The variation of ZR/IAA value in two kinds of alfalfa is significant ($P < 0.05$). And ZR/IAA value in ZXY04P-44 is on the small side. The value of ABA/(IAA + ZR + GA₃) in two kinds of alfalfa under Treatment B decreased (Figure 1, 2, 3, 4).

Conclusions With the increasing degree of water stress, with the exception that IAA and ABA content gradually increases, indicating the water stress improved the potential regulating capacity of IAA; ABA content increased in ZXY04P-44 under Treatment D, indicating the capacity of alfalfa with strong drought resistance in directly resisting water stress under severe drought condition is stronger than alfalfa with poor drought resistance. Under water stress, alfalfa releases water shortage pressure by slowing growth rate. According to ZR/ABA, ZR/IAA, ABA/(IAA + ZR + GA₃), under water stress, the antagonism of ZR and ABA in two kinds of alfalfa goes towards a stomata closure trend; With increasing degree of water stress, ZR/IAA value in alfalfa gets smaller and smaller, which will benefit the root system growth of the plant, the ZXY04P-44 value is the smallest under severe water stress, indicating benefit to root system growth. ABA/(IAA + ZR + GA₃) value decreased and then increased, indicating four hormones in two kinds of alfalfa coordinate towards direction of inhibiting growth under mild water stress and towards direction of promoting growth under moderate and severe water stress, and the growth promotion trend in ZXY04P-44 is stronger.

Reference

Davies W. J., Metcalf J., Lodge T. A., Plant growth substance and the regulation of growth under drought. *Aus J Plant Biol*, 1986, 13: 105-125.