

Snow depth effects on cold-resistance and winter surviving rate of different fall dormancy alfalfa

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Abstract: Four alfalfa cultivars with different fall dormancy levels (rating 2 Alfaqueen, rating 5 Magna551, rating 8 WL525HQ, and rating 10 Sardi10) were used to study the snow depth effect on cold-resistance and overwintering rate of alfalfa. Four cultivars were maintained with 0, 10, and 15 cm winter snow depths. Temperatures were monitored for alfalfa canopy-level and soil surface (1~10 cm), dynamic variations in malondialdehyde (MDA), soluble sugar (SS) and soluble protein (SP) contents in collar and stand counts were made each fall and spring to assess winter injury. The results showed that the winter survival rate of low fall dormancy alfalfa (2, 5) were 64% and 59% respectively without snow cover, but the high fall dormancy alfalfa(8, 10) all died. Except fall dormancy 10 (Sardi10), the thickness of snow covered 10 cm could ensure the winter safety of alfalfa. What's more, the winter survival rate of more than 90%. With the increase of thickness of overlying snow, the snow cover significantly moderated winter air temperatures at canopy-level of alfalfa and soil surface, it could significantly improve different alfalfa winter survival rates ($P<0.05$), and increase SP and SS contents of the non and Extremely non fall dormancy alfalfa. Besides, it could also decrease the MDA content. Membership function analysis showed that the order of cold-resistance and winter surviving rate of alfalfa cultivars without snow cover was listed as follows: Alfaqueen>Magna551; snow cover thickness of 10 cm the order of cold-resistance and winter surviving rate of alfalfa cultivars was listed as follows: Magna551>Alfaqueen > WL525HQ > Sardi10; However, once the snow thickness was changed to 15cm new order was list as follows: Magna551>Alfaqueen=WL525HQ=Sardi10.

Key words: alfalfa; fall dormancy; cold-resistance