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 (PMagna551; 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

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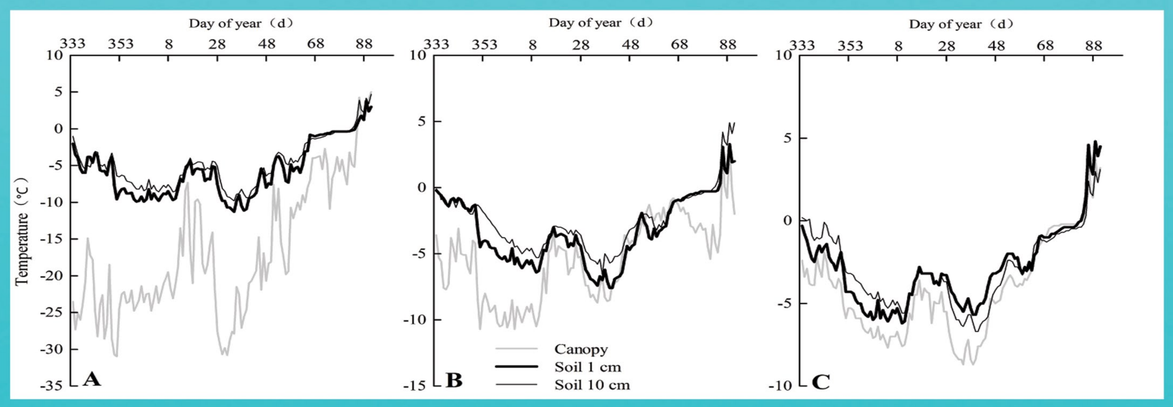

Note: In the figure 1, A, B, C stands for daily minimum temperatures at canopy level and 1 cm soil depth, and 10 cm soil depths with 0 cm, 10 cm and 15 cm Snow Depth treatments.

Fig.1 Daily minimum temperatures at canopy level and 1cm soil depth, and 10 cm soil depths with different snow cover treatments

Table 1 Analysis of the membership function of different fall dormancy level under different snow cover thickness

Snow depth	Cultivar	Rating	MDA	WSC	SP	Winter surviving rate	Average
0 cm Snow depth	Alfaqueen	2	0.87	0.47	0.49	0.64	0.62
	Magna551	5	0.92	0.47	0.42	0.59	0.60
	WL525HQ	8	0.80	0.26	0.32	0.00	0.35
	Sardi10	10	0.76	0.28	0.34	0.00	0.35
10 cm Snow depth	Alfaqueen	2	0.80	0.44	0.48	0.95	0.67
	Magna551	5	0.92	0.47	0.39	0.94	0.68
	WL525HQ	8	0.88	0.43	0.39	0.94	0.66
	Sardi10	10	0.84	0.48	0.45	0.72	0.62
15 cm Snow depth	Alfaqueen	2	0.83	0.45	0.44	0.94	0.66
	Magna551	5	0.93	0.51	0.47	0.98	0.72
	WL525HQ	8	0.87	0.45	0.40	0.92	0.66
	Sardi10	10	0.87	0.44	0.43	0.91	0.66