

Growth Condition of *Allium hookeri* root by Heat Conservation Materials during Overwintering

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Abstract

Allium hookeri is used for food and medical materials in Asia. It is a wild herb distributed in India and Myanmar but it is cultivated as a vegetable crop in Korea. It contains dietary sulfur compounds about six times higher than Garlic and protein, sugar, fiber, ascorbic acid, phytosterol and total phenol much higher than Onion. During the investigation, the surface had a minimum temperature of -15.8°C in Control, and maximum temperature of 28.7°C in Double Tunnel Cover. Underground depth(15cm) had a minimum temperature of -3.2°C in the Control, and maximum temperature of 10.4°C in Double Tunnel Cover. Under the ground(15cm depth) had 72.1% degrees of relative humidity in Horticultural Bed Soil, 53.3% degrees of relative humidity in White Non-woven Fabric, 59.6% degrees of relative humidity in Transparent PE film, 46.2% degrees of relative humidity in Straw and 55.7% degrees of relative humidity in Control. Latent buds of *A. hookeri* first sprout out in Horticultural Bed Soil on February. 27, in White Non-woven Fabric and Transparent PE film on February. 28 and in Straw and Control on March. 2. On March. 9, Latent buds of *A. hookeri* all sprout out in Horticultural Bed Soil, 95 degrees percent sprout out in White Non-woven Fabric, 76 degrees percent sprout out in Transparent PE Film, 52 degrees percent sprout out in Straw and 46 degrees percent sprout out in Control. The growth characteristics observed after overwintering period. So, the most adequate type of mulching materials at Non-Tunnel Cover on the plant growth of *A. hookeri* after overwintering was Horticultural Bed Soil(262% higher than Control) and mulching materials were ranked in weight order. [Complex Non-woven Fabric(233.8% higher than Control), Black Non-woven Fabric(129.6% higher than Control), Expanded Rice Hull(105.9% higher than Control), Black PE Film(98.5% higher than Control), White Non-woven Fabric(45.1% higher than Control), Illite(26.6% higher than Control), Transparent PE Film(7.4% higher than Control) and Straw(2.3% higher than Control)]. The most adequate type of mulching materials at Single-Tunnel Cover on the plant growth of *A. hookeri* after overwintering was Horticultural Bed Soil(70.7% higher than Control) and mulching materials were ranked in weight order. [Complex Non-woven Fabric(62.4% higher than Control), White Non-woven Fabric(33.9% higher than Control), Black Non-woven Fabric(30.4% higher than Control), Expanded Rice Hull(18.0% higher than Control), Black PE film(6.1% higher than Control), Straw(-7.0% higher than Control), Transparent PE film(-4.5% higher than Control) and Illite(-24.0% higher than Control)]. Latent bud in Double-Tunnel Cover was the fastest germinated but Fresh Weight in Single-Tunnel Cover weighs more than Double-Tunnel Cover.

With these results, this study suggested that adequate mulching materials on the growth of *A. hookeri* during overwintering was Horticultural bed soil(30mm thickness) and Complex non-woven fabric at Single-Tunnel Cover.

Additional key words : *Allium hookeri*, heat conservation materials, overwintering crop.

Materials & Methods

This study was conducted to identify appropriate heat conservation materials on *A. hookeri* during overwintering period. It was prepared approximately 5~6cm length of root which contains four latent bud. In this study, surface mulching materials used during overwintering period were Horticultural Bed Soil(30mm thickness), Straw(40mm thickness), Transparent PE Film(0.1mm, transparent), White Non-woven Fabric(60g/m²), Black Non-woven Fabric(60g/m²), Expanded Rice Rull(30mm thickness), Black PE Film(0.012mm) and Control. Tunnel cover material used was Transparent PE film(0.1mm)



Fig 1. Used *Allium hookeri* root

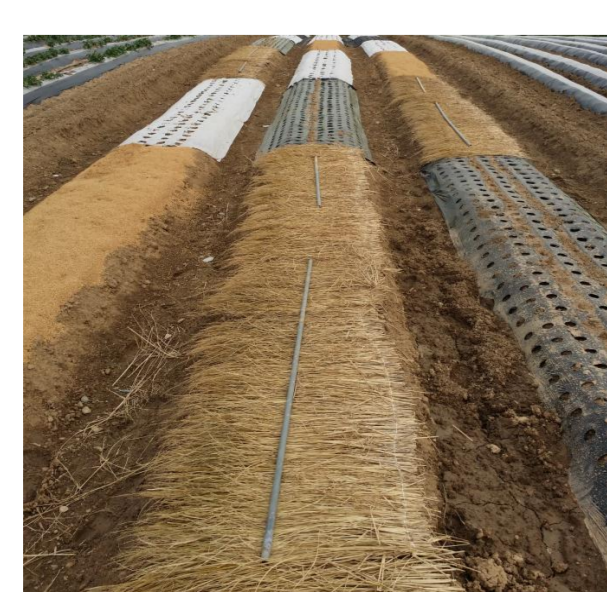


Fig 2. Used heat conservation materials



Fig 3. Used tunnel covers



Fig 4. Growth Status

Results

Table 1. The number of germination latent bud and germination date in Tunnel and Surface Cover

Treatment	2.26	2.27	2.28	2.29	3.01	3.02	3.03	3.04	3.05	3.06	3.07	3.08	3.09	3.10	3.11	3.12	3.13	3.14
I	①	-	-	-	-	-	-	-	-	-	-	2	23	16	8	21	6	16
	②	-	-	-	-	-	-	-	3	18	24	18	19	4	7	2	5	-
	③	-	-	-	-	-	-	-	-	2	3	7	16	14	21	25	11	1
	④	-	-	-	-	-	-	-	-	1	5	26	24	21	3	15	5	-
	⑤	-	-	-	-	-	-	-	-	1	11	16	15	14	23	16	4	-
	⑥	-	-	-	-	-	-	-	-	3	3	2	1	28	22	17	16	6
	⑦	-	-	-	-	-	-	-	-	-	1	3	15	11	31	3	19	16
	⑧	-	-	-	-	-	-	-	-	5	16	11	17	5	27	12	3	2
	⑨	-	-	-	-	-	-	-	-	-	12	11	9	18	16	24	5	4
	⑩	-	-	-	-	-	-	-	-	5	31	19	15	11	8	2	3	-
II	①	-	-	-	-	5	5	3	16	11	3	2	3	13	31	-	-	-
	②	-	4	3	4	10	11	9	7	22	18	6	4	2	-	-	-	-
	③	-	-	1	12	11	8	10	9	3	18	17	5	1	3	1	-	-
	④	-	-	-	-	8	7	7	13	14	6	11	18	7	6	2	1	-
	⑤	-	2	1	6	8	16	12	13	9	8	24	1	-	-	-	-	
	⑥	-	-	-	-	3	4	12	12	11	22	6	3	2	2	6	7	3
	⑦	-	-	-	-	8	3	17	12	2	2	1	1	2	31	14	6	
	⑧	-	1	1	10	25	16	2	4	4	7	6	18	6	-	-	-	
	⑨	-	-	-	-	2	12	18	17	3	15	8	7	1	13	3	1	
	⑩	-	-	2	8	5	12	10	13	11	7	6	-	2	5	11	6	
III	①	-	1	11	16	5	18	21	14	11	3	-	-	-	-	-	-	
	②	-	6	26	21	15	15	5	3	8	-	1	-	-	-	-	-	
	③	-	8	25	12	13	12	18	6	3	-	-	-	-	-	-	-	
	④	-	-	-	3	15	10	22	29	3	14	4	-	-	-	-	-	
	⑤	-	8	16	19	11	25	6	15	-	-	-	-	-	-	-	-	
	⑥	-	2	18	14	16	21	20	4	-	-	-	-	-	-	-	-	
	⑦	-	-	2	10	15	16	17	5	21	3	8	2	1	-	-	-	
	⑧	-	-	4	6	32	14	18	21	4	1	-	-	-	-	-		
	⑨	-	1	3	10	8	7	26	21	3	14	2	2	2	1	-	-	
	⑩	-	3	10	22	21	13	18	8	-	-	-	-	-	-	-		

Table 2. Growth condition of *Allium hookeri* root by heat conservation materials and tunnel cover during overwintering

Treatment	Fresh weight (g/plant)	Dry weight (g/plant)	Rate of Fresh & Dry weight (%)	Root length (cm)	Root diameter (mm)	Tiller number	Soluble Solids (°Brix)
I	①	58.2 lm ²	8.7 k	15.0 i	19.0 fghij	5.18 a	39.6 gh
	②	195.8 bcde	34.3 cde	17.5 efghi	23.5 ab	4.74 bc	63.6 bc
	③	78.5 l	11.1 k	14.1 i	18.3 hij	4.97 ab	50.6 defgh
	④	124.2 ijk	22.1 ij	17.8 cdefgh	20.8 cdefgh	4.05 hijk	49.8 defgh
	⑤	183.3 def	33.6 de	18.3 abcde	22.4 abc	4.50 e	64.4 bc
	⑥	68.5 lm	11.4 k	16.6 ijk	16.8 j	4.07 ijkl	42.2 fgh
	⑦	48.3 m	8.2 k	17.1 hijk	19.2 fghij	3.79 m	44.6 efgh
	⑧	111.4 k	20.9 ij	18.8 ab	21.4 bcdef	4.16 ghij	39.4 h
	⑨	107.4 k	19.8 j	18.4 abcde	20.6 cdefgh	3.88 klm	54.2 cde
	⑩	54.1 lm	7.8 k	14.5 i	17.8 ij	3.88 klm	39.8 gh
II	①	147.8 hi	24.6 hij	16.6 ijk	19.5 efghi	4.12 hijk	44.6 efgh
	②	264.1 a	46.3 a	17.5 efghi	21.8 abcde	4.37 efg	73.6 ab
	③	207.1 bcd	36.2 bcd	17.5 efghi	20.5 cdefgh	4.07 ijkl	57.8 cd
	④	201.8 bcde	37.5 bcd	18.6 abc	20.5 cdefgh	3.82 lm	49.4 defgh
	⑤	251.2 a	45.7 a	18.2 bcdef	22.6 abc	3.90 jklm	77.4 a
	⑥	117.5 jk	20.2 j	17.2 ghijk	19.8 defghi	4.42 efg	53.2 cdef
	⑦	143.8 hi	25.7 ghi	17.9 bcdefg	21.0 cdefg	4.79 bc	51.6 def
	⑧	182.5 def	32.7 def	17.9 bcdefg	20.9 cdefg	4.38 efg	53.4 cdef
	⑨	164.1 fgh	30.4 efg	18.5 abc	19.6 efghi	4.12 hijk	54.2 cde
	⑩	154.7 gh	25.1 hi	16.2 k	20.6 cdefgh	4.16 ghij	56.2 cde
III	①	198.3 bcde	32.7 def	16.5 jk	22.2 abcd	4.38 ef	51.2 defg
	②	211.6 bc	36.2 bcd	17.1 ghijk	23.7 ab	4.12 hijk	73.4 ab
	③	207.7 bcd	39.8 b	19.2 a	22.0 abcde	4.16 ghij	54.2 cde
	④	189.3 cdef	32.8 de	17.3 fghij	21.9 abcde	4.69 cd	53.2 cdef
	⑤	217.0 b	38.6 bc	17.8 cdefgh	21.2 bcdef	4.17 ghij	77.4 a
	⑥	203.2 bcde	38.8 bc	19.1 a	24.2 a	4.53 de	48.4 defgh
	⑦	140.1 hij	24.6 hij	17.6 defghi	18.6 ghij	4.18 fghi	44.8 efgh
	⑧	155.0 gh	27.9 fgh	18.0 bcdefg	24.0 a	4.13 ijkl	49.6 defgh
	⑨	177.7 cdef	33.2 de	18.7 abc	20.4 cdefgh	4.39 ef	57.2 cd
	⑩	142.7 hij	23.3 hij	16.3 k	20.5 cdefgh	4.26 efgh	55.8 cde

Significance ^y

Two-Way Anova A *** B *** A+B ***
 I : Control(Non-covered), II : Single Tunnel Cover, III : Double Tunnel Cover
 ① Transparent PE film, ② Horticultural bed soil, ③ White non-woven fabric, ④ Black non-woven fabric, ⑤ Complex non-woven fabric(White & Black), ⑥ Illite, ⑦ Straw, ⑧ Expanded Rice Hull, ⑨ Black PE film, ⑩ Control(Non-covered)

References

Yoo, Y. K. and B. W. Kim. 2006. Effects of Mulching Material and Planting Method on Bulb Growth in Microtuber of *Zantedeschia* spp. Korean Journal of Horticultural Science & Technology 24(3), 2006.9, 382-387
 Joo, S. J., J. H. Jeong, K. H. Lee and S. W. Whang. 1999. Effect of Heat-Conservation Method on Watermelon (*Citrullus lantatus* THUNG.) in Unheated Plastic Hosue. The Korean Society For Bio-Environment Control, 87-91