

Research Article



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질소관비 수준이 래빗아이 블루베리 ‘브라이트웰’의 생장과 양분흡수에 미치는 영향

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Effect of Nitrogen Fertigation on The Growth and Nutrition Uptake of ‘Brightwell’ Rabbiteye Blueberry

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Abstract

BACKGROUND: Rabbiteye blueberry (*Vaccinium ashei* Reade) has low nutrient uptake efficiency due to its shallow and fibrous root system without root hairs. This study was carried out to establish an efficient nutrient application standard by investigating the effect of nitrogen fertigation on the growth and fruit characteristics of rabbiteye blueberry.

METHODS AND RESULTS: ‘Brightwell’ rabbiteye blueberry was treated with 0, 50, 100 and 200% nitrogen fertigation of recommended fertilizer application (6, 9 and 14 g/bush in the first, second and third years, respectively). The results showed that leaf nitrogen content significantly correlated with the fruit weight and fruit yield. However, canopy area, dry weight, sugar and anthocyanin contents did not correlate significantly with the leaf nitrogen content. The leaf and stem dry weights of ‘Brightwell’ rabbiteye blueberry during the third year of planting were the highest with 50% nitrogen fertigation (leaf dry weight=723.7

g/bush; stem dry weight=890.7 g/bush). Maximum fruit yield of ‘Brightwell’ rabbiteye blueberry (12.9 kg/bush) was observed during the third year of planting with 50% nitrogen fertigation and this was about 70% greater than the treatment that received no nitrogen fertigation. The fruit yields of ‘Brightwell’ rabbiteye blueberry during the third year of planting treated with 100 and 200% nitrogen fertigation were 11.0 and 11.5 kg/bush, and these were 17 and 12% lower than the 50% nitrogen fertigation treatment, respectively. Further, the efficiency of nitrogen utilization was the highest (90%) with 50% nitrogen fertigation and lowest (18%) with 200% nitrogen fertigation.

CONCLUSION: The results of this study suggests that fertigation with 50% of the recommended fertilizer could be most effective for enhancing the growth and nitrogen use efficiency of rabbiteye blueberry.

Key words: Growth, Nitrogen Fertigation, Rabbiteye blueberry, Soil

서론

(*Vaccinium corymbosum* L.)

(*V. corymbosum* hybrid)

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Table 1. Physicochemical properties of soil used in this experiment (n=3)

pH	EC	OM	Av.P ₂ O ₅	Exch. Cation			NH ₄ -N	NO ₃ -N	Soil texture	Particle size distribution		
				K	Ca	Mg				Sand	Silt	Clay
(1:5)	(dS/m)	g/kg	(mg/kg)	----	cmol _c kg ⁻¹	----	---	mg kg ⁻¹	----	(%)		
4.53	0.73	47.6	228	0.25	10.5	2.30	25.9	14.7	Loam	45	39	16
±0.04	±0.02	±0.81	±6.66	±0.02	±0.32	±0.01	±1.40	±0.93		±6.4	±3.9	±3.2

(*V. ashei* Reade)

가

가

(Gough, 1993; Retamales and Hancock, 2012).

가

pH

재료 및 방법

가

(Gough, 1993).

3

'Brightwell'

가 (Williamson

(*V. ashei* Reade)

3

and miller, 2009; Vargas and Bryla, 2015).

(30%, v/v)

(Kim

(Bhat, 1983; Klein and Spieler, 1987; Merwin and Stiles, 1994; Claussen and Lenz, 1999),

et al., 2010).

1.2 m,

40 cm

pH

5.5

, 5.0

5

10 1.5 m×4 m

(Hartz *et al.*, 2005).

Table 1

3~4

pH

(pH 4.5~5.5,

kg/10a (Throop and Hanson, 1997; Wilber and Williamson, 2008; Banados *et al.*, 2012).

OM 40g/kg)

(Haynes and

Swift, 1985; Korcak, 1989; Gough, 1993).

(1-2-3 : 6-9-14 g/bush)

pH

50, 100

200%

가

7

가

20

가

1989; Kang *et al.*, 2001).

가

60%,

40%

(Hagin and Lowengart, 1996; Li *et al.*, 2003; Hartz *et al.*, 2005).

2011).
, 2

-15 kPa

1

(Kim *et al.*,

가

가(Finn

and Warmund, 1996; Vargas and Bryla, 2015),

(Bryla and Machado, 2011),

가(Glonek and Komosa, 2004),

가

(Ehret *et al.*, 2014),

(Bryla *et al.*, 2008)

가

(Black and Zimmerman, 2002).

가

3

10

7 5

8 31

(Kim *et al.*, 2003; Retamales and Hancock, 2012).

3~5

Table 3. Effect of nitrogen fertigation on the growth properties of rabbiteye blueberry 'Brightwell' in the third year of planting

Fertigation rate	Canopy area (m ³)	Dry weight (g/bush)		N uptake (g kg ⁻¹)	
		Leaf	Stem	Leaf	Stem
Control 1 ^z	4.86 ^{ns} (1.86c ^w) ^v	616.6ab	471.7 ^{ns}	13.1 ^{ns}	5.97ab
Control 2 ^y	5.79 (2.27bc)	375.0b	458.0	12.2	4.78ab
50%	9.61 (2.71ab)	723.7a	890.7	14.4	4.51b
100% ^x	6.41 (2.82ab)	584.2ab	812.3	13.1	6.19a
200%	9.16 (3.04a)	612.0ab	796.3	11.5	5.23ab

^zRegular fertilization practice in a Korean blueberry farm^yNo nitrogen fertigation^xThe 100% fertigation indicates 6, 9 and 14g/bush in 1st-, 2nd- and 3rd-year after bushing^wMean separation within columns by Duncan's multiple range test at *p*=0.05^vParentheses indicate results of 2nd year after bushing.**Table 4. Effect of nitrogen fertigation on the fruit properties of rabbiteye blueberry 'Brightwell' in the third year of planting**

Fertigation rate	Yield (kg/bush)	Fruit number (No./bush)	Fruit weight (g/berry)	Soluble solids content (°Brix)	Titrateable acidity (%)	Antocyanins (mg 100g ⁻¹)
Control 1 ^z	9.41bc ^w (2.15c) ^v	6,396ab	1.54 ^{ns}	13.6 ^{ns}	0.57 ^{ns}	686.9a
Control 2 ^y	7.58c (2.40c)	5,370b	1.41	14.3	0.29	552.8bc
50%	12.9a (3.13b)	8,210a	1.57	13.3	0.26	467.8c
100% ^x	11.0ab (3.67ab)	7,695a	1.43	13.9	0.26	507.4c
200%	11.5ab (3.97a)	7,990a	1.43	14.0	0.27	635.7ab

^zRegular fertilization practice in a Korean blueberry farm^yNo nitrogen fertigation^xThe 100% fertigation indicates 6, 9 and 14g/bush in 1st-, 2nd- and 3rd-year after bushing^wMean separation within columns by Duncan's multiple range test at *p*=0.05^vParentheses indicate results of 2nd year after bushing.

가 96 dm³ 가 58% 471.7 g/bush 50% 가
 가 14.4g kg⁻¹ 6.19g
 가 kg⁻¹ 100% 가 가
 100%

(Gough, 1993; Retamales *et al.*, 1997).
 가 10 kg 10 a⁻¹ (Ballinger and Kushman, 1966; Cummings, 1978; Spiers, 1983; Bryla and Machado, 2011; Vargas and Bryla, 2015).
 723.7 g, 890.7 g/bush 50% 가
 50% 가 가 200%
 616.6 g/bush
 100%

Table 4

Table 5. Nitrogen utilization characteristics of rabbiteye blueberry 'Brightwell' at the different rate of N fertigation and conventional fertilization for 3 years

Fertigation rate	Nitrogen utilization characteristics		
	N input (g/bush)	N uptake (g/bush)	N recovery (%)
Control 1 ^z	29	24ab ^w	27b
Control 2 ^y	0	16b	0c
50%	15	30a	90a
100% ^x	29	27a	39b
200%	58	27a	18bc

^zRegular fertilization practice in a Korean blueberry farm

^yNo nitrogen fertigation

^xThe 100% fertigation indicates 6, 9 and 14g/bush in 1st-, 2nd- and 3rd-year after bushing

^wMean separation within columns by Duncan's multiple range test at $p=0.05$.

2 가 200% 가 30 g/bush
 65% 가 3.97 kg/bush 50% 가
 2 58% 2.15 kg/bush 3 90% 가 , 200% 가 가 50% 가
 50% 가 12.9 kg/bush (100%)
 70% 가 , 100% 가
 200% 50% 17 12% 가
 가 11 kg/bush 11.5 kg/bush
 3 85% 70% (Rao *et al.*, 1992; Hartl and Erhart, 2005; Kavooosi, 2007).
 9.41 kg 2 가 10~17 kg/bush 50% 가
 (Austin and Bondari, 1988; Holzapfel *et al.*, 2004; Takeda *et al.*, 2008).
 (100%) 가 dm³ 13 kg/bush 50%
 가
 (Patten *et al.*, 1988; Vargas and Bryla, 2015).
 50% 가 8,210 가
 가
 6,396 19% 가
 가 100% 17% 가
 가 1.43~1.57 g, 13.3~14.3 Brix
 0.26~0.57%

요 약

Table 2 Brightwell(*Vaccinium ashei* Reade)
 (Retamales and Hancock, 2012; Kozinski, 2004), (1-2-3 : 6-9-14
 가 g/bush) 50, 100
 (Vargas and Bryla, 2015). 50% 200%
 (1.57 g) 가 (Table 3)
 가 686.9 mg 723.7 g, 890.7 g/bush 50%
 , 552.8 mg 가 가 가 50%
 Table 가 12.9 kg/bush 70% 가
 5 16 g/bush , 100% 200% 50%

17 12%가 11 11.5 kg/bush
50%
가 90% 가 , 200% 가 가 18%
50%
'Brightwell' 가

Notes

The author declare no conflict of interest.

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