#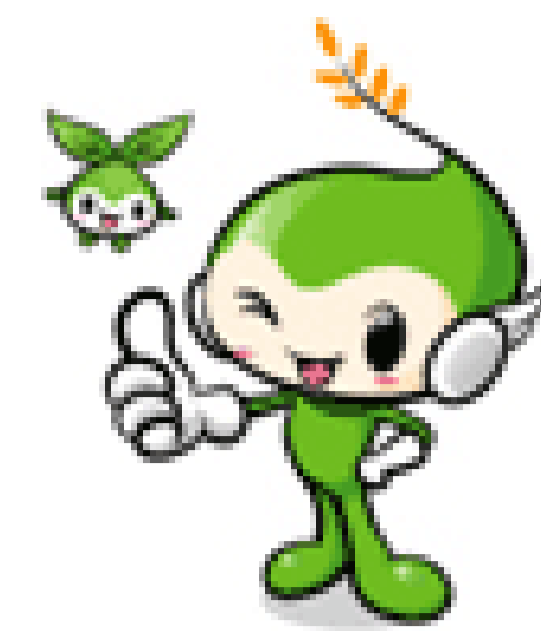 Changes of Tree Growth and Fruit Characteristics on Different Temperature Conditions during Growth Stages in Grapevine (cv. 'Kyoho')

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Introduction

According to a report of the IPCC (2007), the average temperature of the earth has increased by around 1.0℃ during the 20th century. The increase was particularly rapid in the later part of the century, suggesting that global warming is being accelerated. Among the scenarios, RCP 8.5, a scenario on the assumption that there is no effort to reduce greenhouse gas, temperature is expected to increase considerably compared to the present level.

Grapevine is one of important fruit crops produced and consumed in many countries. Compared to other fruit crops of the temperate zone, grapevine is known to grow best in relatively warm regions, but if temperature rises higher than now due to global warming as in the RCP Scenario, it may cause serious problems to plant growth and fruit quality. In the present work, we set future climate conditions with high temperature according to the RCP climate change scenario and apply them to the growth stage of 'Kyoho' grapevine using the temperature gradient chamber (TGC).

Material & Methods

This study was conducted using the TGC at the RDA, NIHHS facility in Jeju, Korea. Mean temperatures were 20.4 ℃ (Ambient temperature), 21.1℃ (L), 22.0℃ (M), and 23.4℃ (H) during the growth period(Apr.~Oct.,2015). Tree growth surveys were measured once in every 2 weeks (total 23 times). Fruit characteristics was conducted at harvest time according to each treatment. The fruit quality was measured by sampling 30 berries from each treatment at random and berry cracking and sunburn were measured during the veraison.
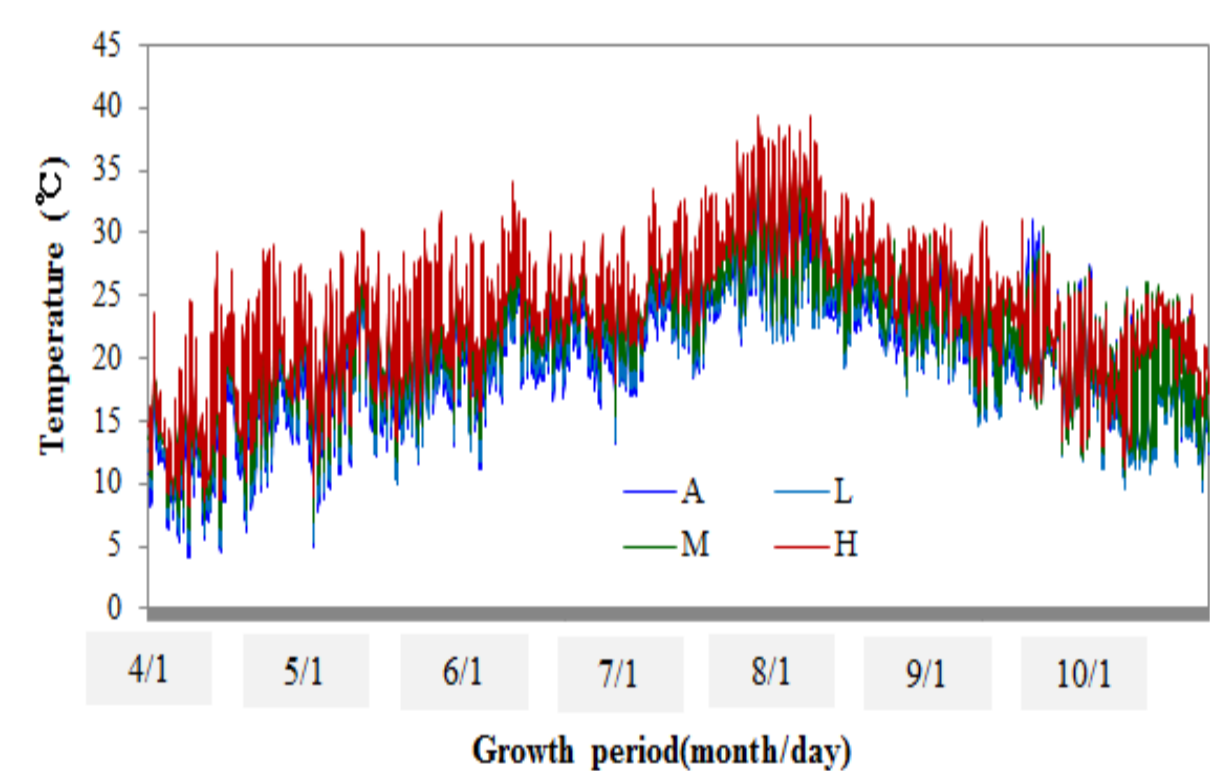
Fig. 1. Mean temperature of growth period

Fig. 2. Grapevine in temperature gradient chamber.

Results

Fig. 3. Effect of temperature conditions on biotic season in 'Kyoho' grapevine. Amb., 20.4℃ (ambient temperature during the growth period); L, 21.1 ℃; M, 22.0 ℃; H, 23.4 ℃.
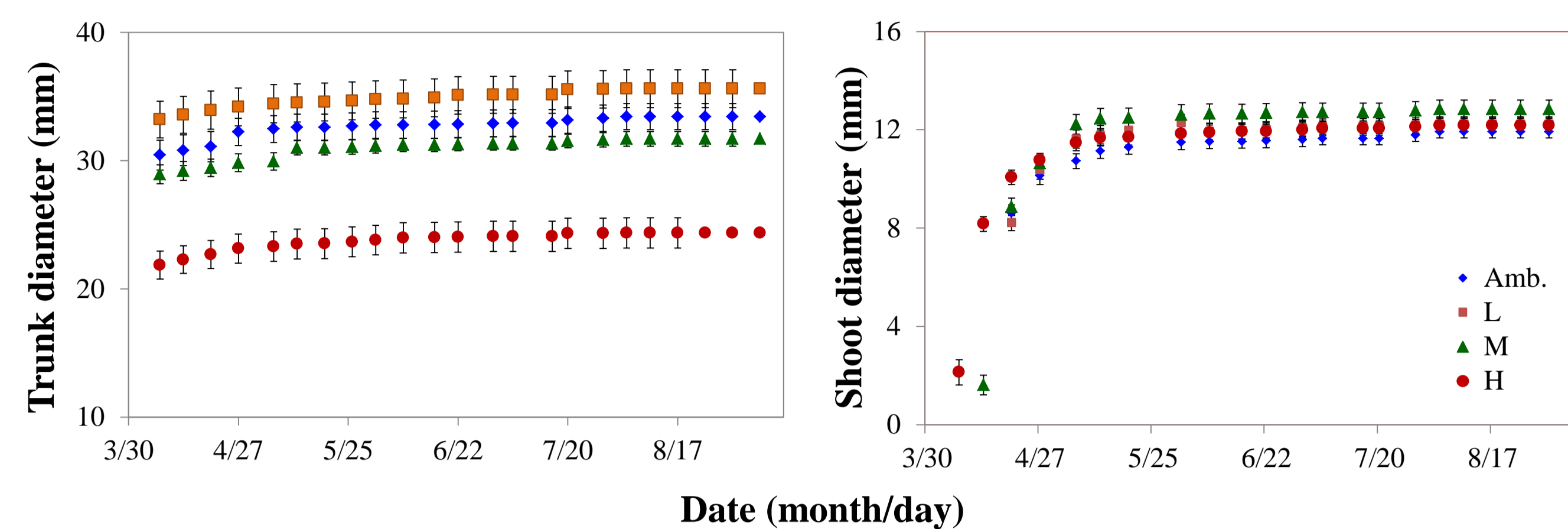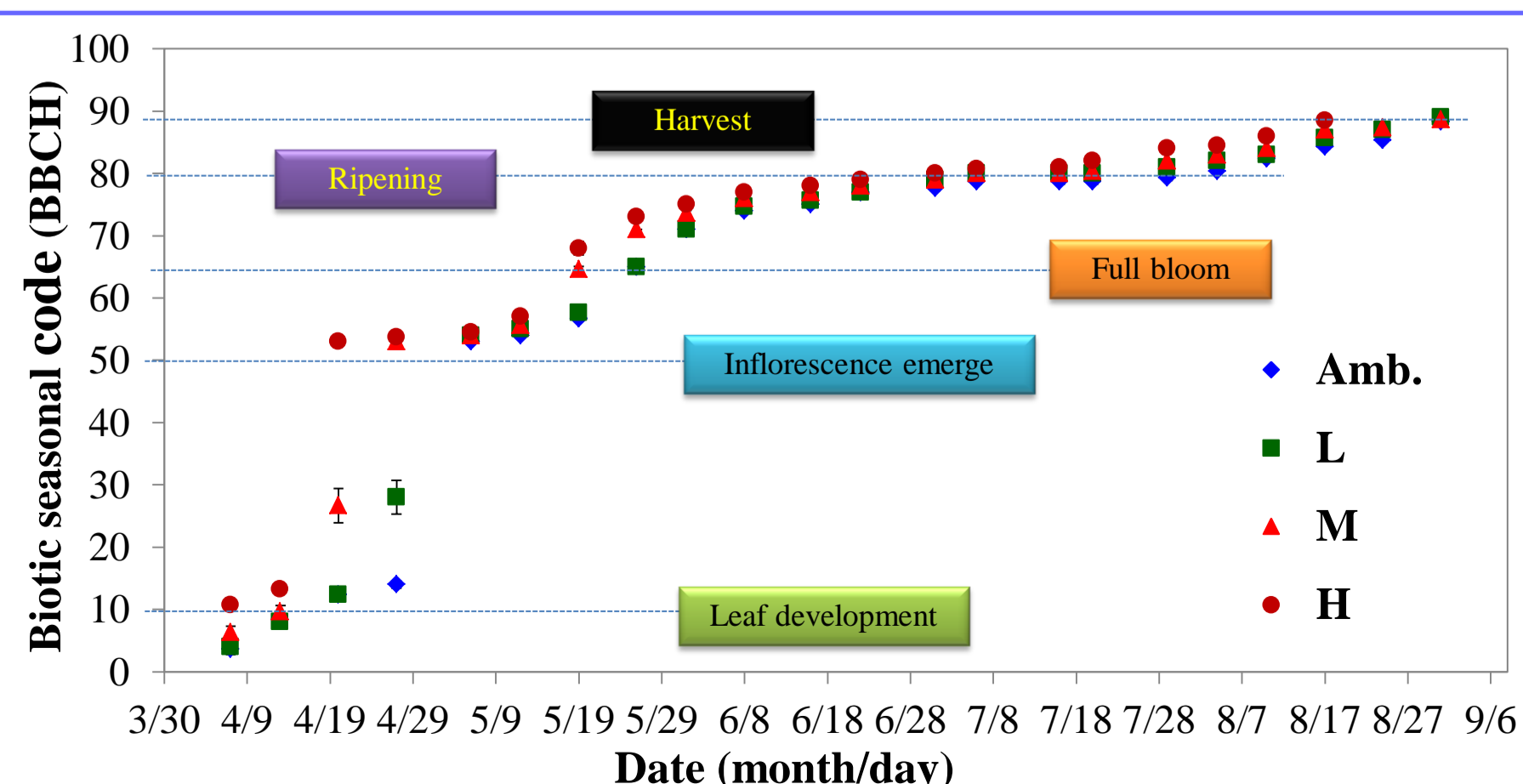
Fig. 4. Fluctuation of tree growth according to different temperature conditions in 'Kyoho' grapevine during the growth period.
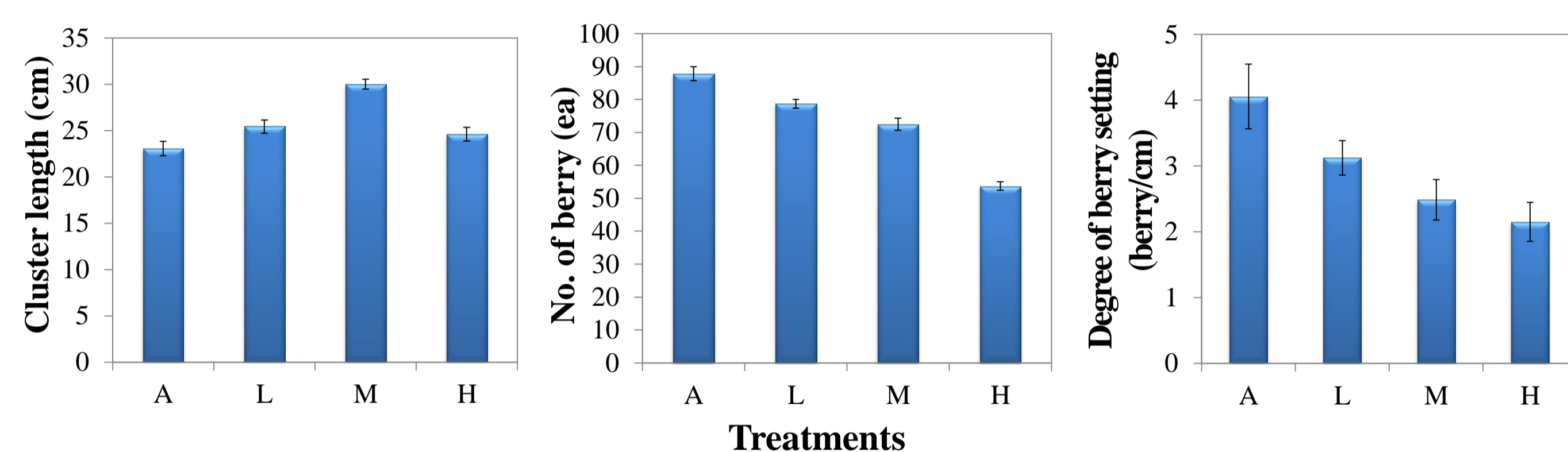
Fig. 5. Effects of different temperature conditions on cluster length, berry number, and degree of berry setting in 'Kyoho' grapevine.

Table 1. Effects of different temperature conditions on fruit characteristic in 'Kyoho' grapevine during the growth period.

Treatments	Cluster Wt. (g)	Berry Wt. (g)	No. of berry (ea)	Berry size (mm)	
				length	Diameter
Amb.	495.3 ab	10.8 ab	43.5 a	25.9 b	25.8 a
L	527.5 a	11.7 a	44.7 a	29.0 a	28.0 b
M	449.8 bc	10.8 ab	42.3 a	29.1 a	27.9 b
H	431.2 c	10.1 b	42.8 a	26.7 b	25.1 a

Table 2. Effects of different temperature conditions on fruit quality in 'Kyoho' grapevine during the growth period.

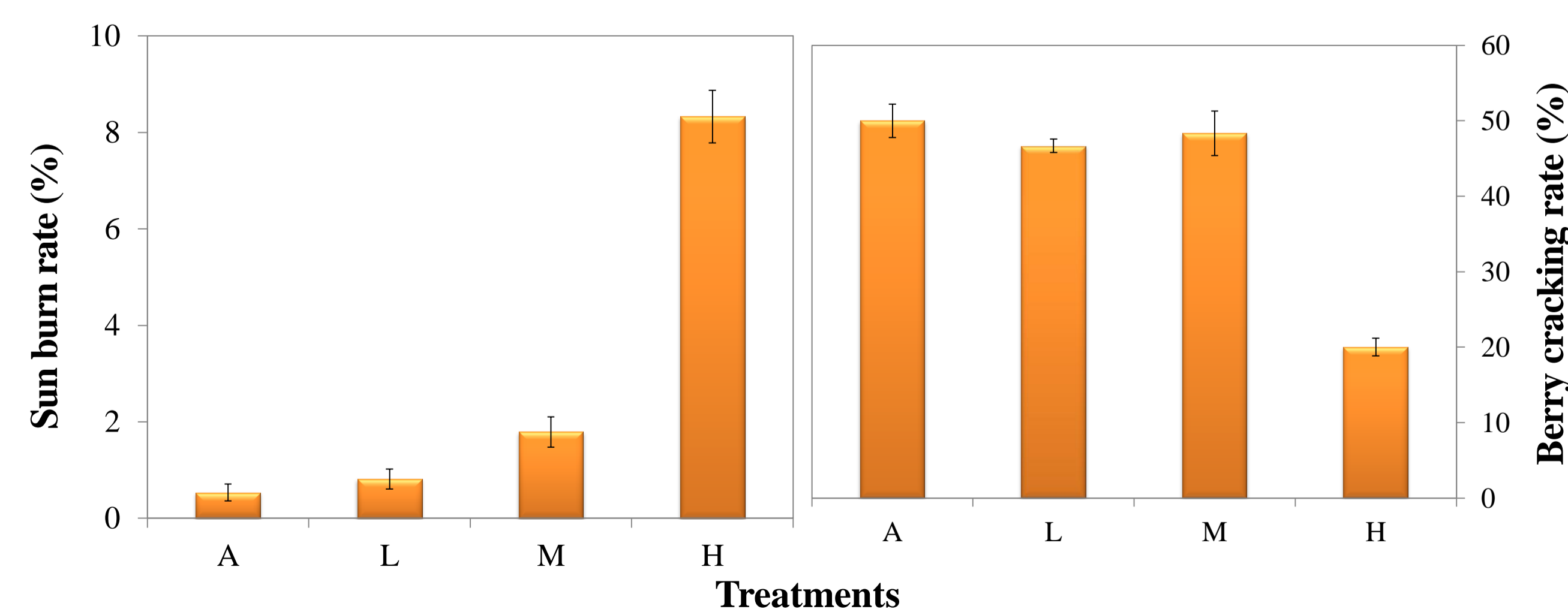| Treatments	Free sugar content			Tartaric acid (mg/100g)	Firmness (kg)
	Fructose	Glucose	Total		
Amb.	25.8 b	82.0 a	107.8 a	54.14 b	13.2 a
L	23.7 c	57.9 b	81.6 ab	52.57 b	11.1 b
M	25.5 b	52.6 b	78.1 ab	75.38 a	11.9 ab
H	30.3 a	31.9 c	62.2 b	53.38 b	11.0 b

Fig. 6. Effects of different temperature conditions on sun burn and berry cracking in 'Kyoho' grapevine during veraison.