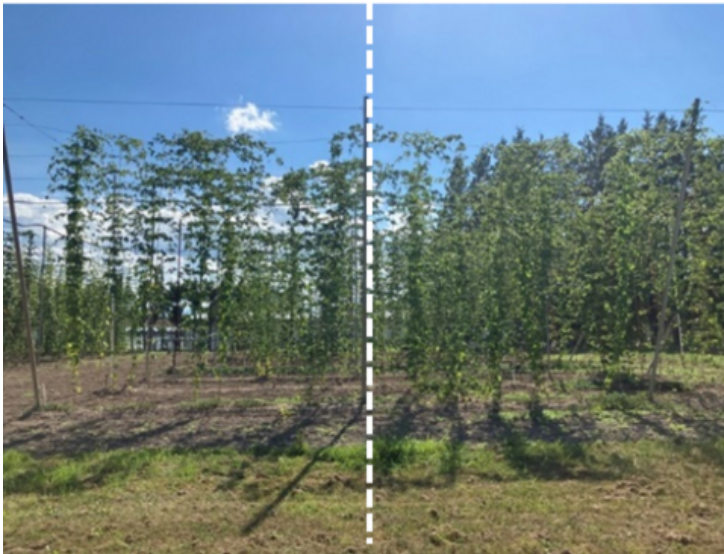


Kirin's seedling innovation ensures stable beer ingredient supply

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This technology was presented at the Scientific-Technical Commission of the International Hop Growers' Convention in June 2025



Field trial in Iwate Prefecture. Variety: *Saaz*.

Left: untreated control plants; Right: heat-treated plants.

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Kirin Holdings Company, Limited (Kirin) has developed a seedling cultivation technology that enhances heat and drought tolerance in hops through acquired tolerance, helping to address the growing challenges of reduced yield and quality caused by extreme heat and drought. This method enables hops to gain resilience without compromising flavor quality, and is expected to contribute to a more sustainable and stable supply of beer ingredients. This technology was presented at the Scientific-Technical Commission of the International Hop Growers' Convention in June 2025.

Global warming is known to act as heat stress on plants, inhibiting their growth. Hops, which prefer cool climates, suffer from poor growth under high temperatures and dry conditions, leading to declining yields and quality worldwide. This raises concerns about rising raw material costs and impacts on product quality, necessitating the development of technologies enabling stable cultivation and procurement even under climate change.

In plants, temperatures higher than their optimal growth range cause heat stress. This can lead to delayed growth and symptoms such as leaf whitening.

Leveraging Kirin's long-standing expertise in plant cultivation technologies, we have developed a seedling production technique to induce heat tolerance and drought tolerance in hop seedlings. This is achieved by growing the seedlings in a liquid medium and applying a six-week heat treatment at 25°C during the mass propagation process. Unlike traditional

breeding or genetic modification, this technique allows hops to acquire resilience without altering their original aroma or flavor profile. This research was evaluated using the Czech variety “Saaz” and the German variety “Hersbrucker.”

In laboratory tests simulating high-temperature and drought conditions, heat-treated hop plants exhibited significantly higher plant height and chlorophyll content compared to untreated control plants, demonstrating improved growth and enhanced tolerance.

Drought condition testing was conducted using the “Saaz” variety only.

Chlorophyll is a natural green pigment essential for photosynthesis. As leaves wither, they turn white or yellow due to reduced chlorophyll levels.

In cultivation evaluations conducted in Esashi City, Iwate Prefecture, heat-treated hop plants showed significantly higher plant height and above-ground weight compared to untreated control plants, and tended to produce higher cone yields.

Moving forward, we will advance the refinement of mass seedling production technology, elucidate physiological changes induced by heat treatment, and verify applicability across multiple fields and varieties, while exploring implementation overseas. Our company aims to contribute to the realization of a sustainable beer ingredient supply.

The Kirin Group will continue to tackle complex and interrelated environmental issues (biological resources, water resources, containers and packaging, and climate change) in an integrated manner, and to work together with all those involved in the value chain to link our desire to enjoy and pass on the bounty of the Earth’s abundance to future generations. We will actively promote various initiatives that have a “positive impact” on nature and people.