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Review Article

Rapid Vegetation Decline of a *Coccinia grandis* Vine under Intense Heat at a University Campus: A Reflective Commentary from Biological and Ecotoxicological Perspectives

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Abstract

Environmental change is often first recognized not through sophisticated instruments but through careful observation of living organisms. In April 2026, a striking contrast was documented in a single established *Coccinia grandis* vine growing near the Department of Biology, Universiti Putra Malaysia, Serdang. Observations on 6 April 2026 show dense, vigorous, and healthy green vegetation with active canopy cover. In contrast, observation on 28 April 2026 after several days of intense hot weather, reveals substantial browning, leaf desiccation, canopy collapse, and visibly damaged fruit tissue on the same vine. Concurrently, nearby classrooms remained uncomfortably warm despite normally functioning air-conditioning systems. This reflective commentary interprets these observations from biological and ecotoxicological perspectives. Biologically, the rapid decline is consistent with acute heat stress, excessive evapotranspiration, disrupted photosynthesis, and reproductive impairment. Ecotoxicologically, elevated temperature may amplify pollutant toxicity, ozone injury, particulate stress, and soil chemical imbalance. Although a single local observation cannot independently prove climate change, the transition from the healthy condition shown in Figure 1 to the stressed condition shown in Figure 2 may represent a localized ecological warning signal consistent with increasing urban thermal stress. Universities should use such observations as living laboratories for sustainability monitoring and climate adaptation research.

Keywords: Coccinia grandis; heat stress; plant bioindicator; campus ecology; ecotoxicology

Introduction

Climate change is often discussed through global averages, remote sensing analyses, and predictive models. However, many of its most immediate manifestations are experienced locally through hotter classrooms, stressed vegetation, drying landscapes, and declining environmental comfort [1]. Biological organisms frequently respond earlier than built infrastructure, making direct ecological observation scientifically meaningful.

A recent example was observed near the Department of Biology, Universiti Putra Malaysia, Serdang, involving a mature *Coccinia grandis* vine (ivy gourd), a perennial climbing species of the Cucurbitaceae family. This species is common in tropical Asia and is recognized for vigorous growth, edible fruits, medicinal value, and capacity to spread over fences, shrubs, and structural supports [2].

Figure 1 presents photographs taken on 6 April 2026, where the same C. grandis vine displayed luxuriant green growth, dense foliage, and strong vegetative vitality. The canopy appeared hydrated and physiologically robust. However, only a few weeks later, Figure 2 shows the same vine on 28 April 2026 after several days of panas terik, with widespread browning, leaf collapse, drying tissues, and a damaged fruit hanging from stressed stems.

Figure 1: Healthy condition of the same *Coccinia grandis* vine near the Department of Biology, Universiti Putra Malaysia, Serdang, photographed on 6 April 2026, showing dense green foliage, vigorous canopy development, and physiological vitality.

Figure 2: The same *Coccinia grandis* vine photographed on 28 April 2026 after several days of intense hot weather, showing browning leaves, canopy collapse, tissue desiccation, and damaged fruit, indicating acute environmental stress.

The sharp contrast between Figures 1&2 is especially meaningful because it involves the same individual vine observed over time rather than different plants. This allows a more direct interpretation of environmental stress response. This commentary explores the observation from biological and ecotoxicological perspectives and considers its implications for climate awareness and campus sustainability.

Biological Interpretation of the Same Coccinia grandis Vine

The contrast between Figures 1&2 strongly suggests a rapid stress response in the same C. grandis vine. In Figure 1, leaf surfaces appear turgid, green, and photosynthetically active, indicating adequate hydration and healthy metabolic functioning. Dense canopy growth is typical of this species under favourable moisture and thermal conditions.

By comparison, Figure 2 reveals a pronounced shift toward senescence and physiological stress. Browned foliage, shrivelled leaves, patchy necrosis, and reduced canopy density are consistent with acute heat injury and dehydration. During intense heat periods, transpiration demand rises sharply. When root water uptake cannot compensate for atmospheric water loss, tissues lose turgor, stomata close, and prolonged stress may lead to leaf scorch and canopy collapse [3].

The damaged fruit shown in Figure 2 further strengthens this interpretation. Fruits are often highly sensitive to heat stress, especially during enlargement and ripening stages. Elevated temperatures can impair cellular integrity, disrupt sugar transport, and induce tissue injury [4]. Thus, the fruit damage visible on the same vine indicates systemic physiological strain rather than isolated leaf aging.

Because C. grandis is generally hardy and fast-growing, such rapid deterioration in a previously vigorous vine suggests that local environmental conditions temporarily exceeded its tolerance threshold.

Ecotoxicological Interpretation

From an ecotoxicological perspective, temperature rarely acts alone. Instead, it modifies the effects of multiple environmental stressors. A vine appearing healthy under moderate conditions, as in Figure 1, may rapidly decline under elevated temperature if simultaneously exposed to urban pollutants, nutrient stress, compacted soil, or altered hydrology.

Higher temperatures can increase pollutant uptake, accelerate metabolic demand, and intensify oxidative stress within plant tissues [5]. Hot sunny days may also favour formation of ground-level ozone, a phytotoxic pollutant known to reduce photosynthesis and injure leaves. Therefore, the stressed foliage shown in Figure 2 may partly reflect interactions between heat and atmospheric contaminants.

Repeated heating and drying of soils may further alter nutrient availability and mobilize trace contaminants. Root systems under thermal stress often become less efficient in selective ion regulation. Under such conditions, this C. grandis vine may function as a practical bioindicator of combined urban stress.

Human Thermal Discomfort and Shared Environmental Signals

A parallel observation was that nearby classrooms remained hot despite functioning air-conditioning systems. This human discomfort mirrors the vegetation stress documented in Figure 2. Buildings exposed to high solar radiation accumulate heat through roofs, walls, and surrounding paved surfaces. Cooling systems may operate normally yet still struggle against excessive external thermal load.

This creates a shared ecological narrative between plants and people. The same environmental conditions that induced wilting in the C. grandis vine outside may reduce comfort, concentration, and wellbeing inside classrooms. Indoor heat exposure has been associated with fatigue, reduced cognitive performance, and diminished learning efficiency [6].

Thus, the stressed vine and overheated classroom may be parallel indicators of one campus microclimate challenge.

Climate Change: A Careful Interpretation

Scientifically, one observation cannot prove climate change. Climate requires long-term datasets rather than isolated hot periods. Nevertheless, comparisons such as Figures 1&2 can serve as useful ecological warning signals when interpreted alongside recurring regional warming trends documented globally [1].

The appropriate scientific interpretation is therefore cautious yet meaningful. The rapid decline of the same C. grandis vine between early and late April may reflect acute local heat stress that is consistent with broader patterns of increasing urban thermal burden. In this sense, the figures do not prove climate change directly, but they may illustrate how climate stress is experienced locally through living organisms.

Universities as Living Laboratories

Universities possess unique potential to transform observations such as Figures 1&2 into research and education. Campus grounds contain vegetation, buildings, traffic zones, and human communities within a manageable setting. They are ideal living laboratories for environmental monitoring.

The decline of this C. grandis vine could initiate structured studies involving repeated photographic documentation, leaf chlorosis scoring, canopy temperature mapping, soil moisture measurements, particulate matter surveillance, and indoor thermal comfort surveys. Such interdisciplinary work would integrate plant biology, ecology, engineering, and public health.

Instead of viewing Figure 2 merely as a damaged vine, universities can interpret it as environmental data.

Personal Reflection from a Biological and Ecotoxicological Lens

As scientists, we are trained to notice subtle change. A leaf that yellows unexpectedly, a fruit that scars under heat, or a classroom that feels warmer than usual may seem trivial to many observers. Yet ecological decline often begins through small deviations from normal conditions.

Figure 1 reminds us what environmental balance looked like for the vine earlier in the month. Figure 2 reminds us how quickly that balance was disturbed. Between the two images lies an important lesson: resilience exists, but so does vulnerability [7].

For an ecotoxicologist, responsibility lies not only in measuring damage after crisis occurs, but in recognizing early warning signs before systems fail. Sometimes the first signal of environmental stress is written on the leaves of a common vine.

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Conclusion

The comparison between Figures 1&2 provides a compelling local case of rapid decline in the same C. grandis vine following several days of intense heat. Biologically, the symptoms are consistent with dehydration, photosynthetic impairment, and reproductive stress. Ecotoxicologically, elevated temperature may have intensified concurrent environmental burdens such as air pollution and soil stress.

Although the images alone cannot confirm climate change, they offer a credible ecological signal consistent with rising thermal stress in urban tropical environments. The simultaneous experience of overheated classrooms further strengthens concern that plants and people are responding to the same environmental pressures.

Declaration on the Use of Artificial Intelligence

The author declares that generative artificial intelligence tools were used in a supportive capacity during the preparation of this manuscript. These tools assisted with language refinement, structural organization, and stylistic clarity of the text. All ideas, interpretations, reflections, and conclusions presented in this paper are the author's own and are grounded in personal experience and scholarly judgment. The author retains full responsibility for the content, accuracy, originality, and integrity of the manuscript.

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