Article: RT0288

Biotica Research Today
Vol 2:8 2020
778 / 779

# Karrikins - The Regenerator of Life

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Open Access

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**Keywords**
Forest fire, Karrikins, Seed germination, Species

**Article History**
Received in 15th August 2020
Received in revised form 17th August 2020
Accepted in final form 18th August 2020

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How to cite this article?
Kumar *et al.*, 2020. Karrikins - The Regenerator of Life. Biotica Research Today 2(8): 778-779.

## Abstract

Recently in 2020, intensive and unprecedented Australian forest fire was threatened humanity and create situation of emergency in the country. No one expected, the life smiles again there, but nature bounce back immediately with no clues. Science hidden in nature is mysterious, and every claim by scientist that the community knows everything - that is wrong. Can we imagine the life become viable in the soil during consecutive phases of massive bushfire? Nature opens its mystery ball and something comes out from it that starts life again-Karrikins. These are usually abundant in smoke and present in soil bound form and play important role in seed germination, osmotic adjustments, stomatal conductance, drought tolerance, primary and secondary metabolisms, chlorophyll concentration, pigmentation components, cuticle maintenance, repression of lateral roots, maintaining root architecture and promotes root – yield relationships in many species.

## Introduction

Karrikins are the organic compounds that generated after burning of plant material. The word Karrikins means smoke or karrik comes out from noongar people of Western Australia that uses this abnormal term for fire and smoke. Karrikinoides or $KAR_1$ was first discovered compound and well known member of Karrikins obtained after burning of xylose sugar.

## Types of Karrakins

The chemical structures of karrakins are most resembling to strigolactones and categorized under six members: $KAR_1$, $KAR_2$, $KAR_3$, $KAR_4$, $KAR_5$ and $KAR_6$. More than 50 synthetic analogs of $KAR_1$ reported so far and used to regulate physiological activities of plants (Antala *et al.*, 2020). These are notable because $KAR_1$ is usually promoting germination of seeds in many species after mass extinction from fire. Abiotic factors without previous fire do not evoke germination of fire ephemerals seeds but this trait is solely relays on changes due to imbibitions, dehydration and Karrikins responsiveness. Some Karrikins dependent seeds remain dormant and grow after forest fire whereas, ephemerals and fire followers' plant shorten their life span shedding seeds that remain dormant till bushfire produced fresh Karrikins to promote them to flourish and start new phase of life. Conceptually, ash release nutrients bound to plants and create nutrient rich region, where seeds can thrive and immediately comes to start their life phase. In Australia, Karrikins stimulates growth of *Anthoceros littorea* seeds in soil after first rain and start fresh growth of plants. The compound termed as 3-methyl-2*H*-furo[2,3-*c*] pyran-2-one was discovered from smoke water that help in plant growth.

## Potential Impact of Karrakins

We can't imagine the seed germination from burning of cigarette smoke might be presence of Karrikins. Probably, these are generated in few regions of bushfires, vaporize and mash up in smoke which upon condensation bound to soil particles. Upon cooling of smoke, these can be easily deposited onto seeds and start germination process. It is likely expected, that smoke carrying Karrikins moved through steam distillation but for short distance, so commonly found close to the soil surface (Yao *et al*., 2020).

Karrikins remains unstable in ultraviolet lights and rapidly declined in natural sunlight but persistent and active in soil for more than 7 years after forest fires. However, concentration of Karrikins can be decline in smoke when washed away by rain and remained enhanced in soil. Karrikins responsive species need after ripening phase or the period of time interval to bury in soil for maturation and series of drying and wetting cycles. Only few species seeds show quick response to burnt landscape and face off Karrikins in soil for germination. However, seeds potential or its ability for a Karrikins response in basic function of plants, but the fire-ephemerals have managed this response in positive manner at fire prone landscape (Antala *et al*., 2020). Even, seeds of tomato, lettuce and horticultural crops will respond positively to Karrikins under some cases. Surprisingly, the responds not only limited to above species but also responds to many dicotyledonous, grasses and agricultural weeds.

## Functional Roots of Karrikins in Plant Growth and Development

However, some fire-followers respond to other smoke responsive compounds such as cyanohydrins – a glyceronitrile compound in *Anigozanthos manlesii* (a green and red kangaroo paw). Some commercial and organic products consist of smoke and wood ash enriched of lignin directly used by nursery growers' help in seed germination with inhibitory response too. The possible prospective comes in existence when chemically synthesized karrakins introduced artificially in soil but it creates chance s to germination of many weeds may called it as suicidal germination (Yueming *et al*., 2020). The Karrikins helps to improve plant height, stem thickness, weight, leaves number, osmotic adjustments, stomatal conductance, drought tolerance, primary and secondary metabolisms, chlorophyll concentration, pigmentation components, cuticle maintenance, repression of lateral roots, maintaining root architecture and promotes root – yield relationships (Yao *et al.,* 2020). The $KAR_{2,}$ another member of Karrikins family respond positively to abiotic stress tolerance in plants. It controls the genetic factors that associated with drought heat and cold stress but the mechanism was still unknown.

## Conclusion

The role of karrakins is diverse and shows its potential in various aspects of plant growth and development. The function was previously restricted on seed germination but recent advancement in agriculture indicates their functionality in respect to osmotic adjustments, stomatal conductance, drought tolerance, primary and secondary metabolisms, chlorophyll concentration, pigmentation components, cuticle maintenance, repression of lateral roots, maintaining root architecture and promotes root – yield relationships. The mutagenicity and genotoxicity responses were tested in *Vicia faba*, *Allium cepa* and other crop plants and finding indicates that karrakins compounds are safe for implementation in horticulture and agriculture crops. Much extensive work need for explore the full potential of these compounds that help our agriculture in sustainable direction under climate change conditions. Studies under lab and field conditions required much attention, before its commercialization at farmer's level. In future, Karrakins might be proved as new candidates for improving crops and considered as plant hormones after successful evidence by plant researcher. In *Brassica tournefortii*, seed germination strongly promoted by Karrakins abundantly produced after vegetation burning.

## References


Antala, M., Sytar, O., Rastogi, A., Brestic, M., 2020. Potential of Karrikins as Novel Plant Growth Regulators in Agriculture. *Plants 9*, 43-60.

Yao, J., Waters, M.T., 2020. Perception of karrikins by plants: a continuing enigma. Journal of Experimental Botany, 71, 1774–1781.

Yueming, K.S., Adrian, S., Yao, J., Melville, K., Steven, M. S., Gavin, R.F., Mark, T.W., 2020. Divergent receptor proteins confer responses to different karrikins in two ephemeral weeds bioRxiv 376939.