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SHORT COMMUNICATION

Enhancing Flowering in Vanilla (*Vanilla planifolia* L.) 'Vania 1' Using Jakaba Fungi and Coconut Water

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Abstract

Flowering is a crucial phase in vanilla (*Vanilla planifolia*) cultivation, heavily influenced by environmental conditions and cultivation practices. This study investigates the combined effects of Jakaba fungi and coconut water, a natural source of plant hormones, on vanilla flowering. The experiment followed a completely randomized block design with 12 treatment combinations and three replications. Each treatment used two plants, with five untreated controls and five plants treated with farmer-standard Jakaba application, for a total of 82 plants. Coconut water was applied at 50, 100, and 150 ml per plant, while Jakaba was used at 150, 200, and 250 ml per plant. The optimal combination—200 ml of Jakaba with 50 ml of coconut water—resulted in the highest flowering and fruiting response. These findings highlight the potential of integrating Jakaba and coconut water to boost vanilla productivity.

Keywords: biofertilizer, coconut water, flowering, hormone, vanilla

Introduction

Vanilla (*Vanilla planifolia*) is a high-value export crop, but several biological and management limitations constrain its productivity. Flower and bud abortion, as well as premature fruit drop, frequently occur under environmental stress conditions (Medina et al., 2009). In addition, the scarcity of effective natural pollinators necessitates hand pollination (Karremans, 2024), and yield can be further reduced by pest and disease pressure and by suboptimal agronomic practices, including inadequate shading, inappropriate pollination timing, and improper staking (Medina et al., 2009).

Biofertilizers have been applied for many years across diverse crop species to enhance soil fertility and plant performance (Wu et al., 2025). In vanilla cultivation, the use of biofertilizers can improve plant vigor and indirectly influence pod development by promoting vegetative growth and yield, enhancing nutrient cycling, improving pod quality, and suppressing diseases. For vanilla vines that have not yet produced pods, foliar fertilizer applications are recommended to stimulate reproductive development. In contrast, foliar inputs should be reduced once pod set has been achieved to avoid excessive vegetative growth at the expense of reproductive output (Wahid et al., 2010).

Jakaba fungi, belonging to the class Sordariomycetes, division Ascomycota, have been identified as promising agents to produce organic fertilizers and have additional potential applications in the propagation of agricultural and forestry species (Fadilah et al., 2024; Herliyana et al., 2025). These fungi are typically cultured on fermented rice rinse water as a substrate (Yusminan, 2022), yielding an inoculum that

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serves as a biofertilizer and is already used empirically by vanilla growers in Indonesia.

Coconut water is a natural source of phytohormones, including auxins, cytokinins, and gibberellins, as well as minerals, soluble sugars, and amino acids that collectively support plant growth and development (Irmayanti & Dewi, 2025; Sulistiya, 2021). It is widely used as an organic supplement in plant tissue culture media, for example, for the in vitro propagation of orchids (Hwang et al., 2024), and therefore represents a plausible biostimulant for vanilla.

Accordingly, this study investigates the effects of Jakaba fungal biofertilizer and coconut water application, alone and in combination, on flowering intensity, fruit set, and pod yield in *V. planifolia* under cultivation.

Materials and Methods

The experiment took place in Bangak Village, Boyolali, Central Java, from August 2022 to January 2023. A completely randomized block design was used with 12 treatment combinations and three replications. Two-year-old vanilla plants were treated with varying doses of Jakaba (150, 200, and 250 ml per plant) and coconut water (25, 50, and 75 ml per plant), and five plants served as a control with a farmer-standard Jakaba. A total of 82 plants were used, consisting of 72 plants for factorial treatments and 10 additional plants for control and farmer-standard comparison. Plant growth, flowering, and yield variables were recorded and analyzed.

Results and Discussion

The combination of 200 ml Jakaba fungal inoculum and 50 ml coconut water markedly enhanced both flower production and fruit set in vanilla plants, indicating a strong positive interaction between microbial and hormonal inputs. Jakaba fungi have been reported to promote nutrient uptake, whereas coconut water is known to stimulate hormonal activity associated with growth and reproduction (Ariyanti et al., 2021).

Fertilizer application to the growth substratum appears to be critical for improving reproductive performance and bean yield in vanilla, while foliar fertilization alone did not measurably increase crop productivity. Nutrient remobilization from mature leaves to developing racemes has also been suggested, potentially further supporting flower and fruit development under appropriate nutritional regimes (Diez et al., 2016).

Not all vines flowered during the observation period, and some inflorescences or developing fruits aborted between 2 and 6 weeks after treatment (WAT) (Table 1). The dose of 200 ml of Jakaba plus 50 ml of coconut water appears to be optimal for supporting vegetative growth and the transition to flowering, as higher doses can disrupt the microbial balance in the rhizosphere. In contrast, lower doses fail to elicit a significant physiological response (Yusminan et al., 2022).

A similar pattern was observed for fruit set: the combination treatment produced the highest and most consistent fruit set on plants receiving the 200 ml Jakaba + 50 ml coconut water treatment produced fruits, whereas the remaining treatments did not result in successful pod formation (Table 2). To date, there are no published reports on the direct effects of coconut water on vanilla flowering and fruiting under field conditions. However, coconut water has been successfully used as a supplement in in vitro culture of orchids (Santosa et al., 2025) and in the rooting and early growth of vanilla cuttings (Firando, 2021).

In addition to biostimulant treatments, environmental factors such as solar radiation and shading intensity, temperature, relative humidity, and the efficiency and timing of hand pollination exert substantial influence on vanilla yield and may interact with nutritional and microbial management to determine final pod production (Guk et al., 2024).

Treatment with the Jakaba fungi and coconut water showed no significant effects on the organic C content, N, P, K, and C/N ratio of vanilla leaf (Table 3). Research by Pérez et al. (2021) showed that applying coconut water during the early phase of vanilla flowering significantly

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affected fruit dimensions and dry matter accumulation, indicating increased synthesis of organic components in the plant. Conversely, lower nitrogen availability can increase the C/N ratio. This suggests that increasing nitrogen availability by adding activators can reduce the C/N ratio.

Table 1

Flower Number per Plant in Response to Different Jakaba–Coconut Water Treatment Combinations

Treatments	2 WAT	4 WAT	6 WAT
Control	0	0	0
Jakaba 200 ml	0	8	12
Coconut water 50 ml	2	1	9
Jakaba 150 ml + coconut water 25 ml	0	0	0
Jakaba 150 ml + coconut water 50 ml	0	0	0
Jakaba 150 ml + coconut water 75 ml	0	0	0
Jakaba 200 ml + coconut water 25 ml	0	0	0
Jakaba 200 ml + coconut water 50 ml	9	29	17
Jakaba 200 ml + coconut water 75 ml	0	0	0
Jakaba 250 ml + coconut water 25 ml	0	0	0
Jakaba 250 ml + coconut water 50 ml	0	0	0
Jakaba 250 ml + coconut water 75 ml	0	0	0
	ns	ns	ns

Note. WAT = weeks after treatment; ns = non significant.

Table 2

Fruit Number per Plant in Response to Different Jakaba–Coconut Water Treatment Combinations

Treatment	Week after treatment							
	6	8	10	12	14	16	18	20
Control	0	0	0	0	0	0	0	0
Jakaba 200 ml	12	8	8	9	9	9	9	9
Coconut water 50 ml	3	9	11	12	12	10	10	10
Jakaba 150 ml + coconut water 25 ml	0	0	0	0	0	0	0	0
Jakaba 150 ml + coconut water 50 ml	0	0	0	0	0	0	0	0
Jakaba 150 ml + coconut water 75 ml	0	0	0	0	0	0	0	0
Jakaba 200 ml + coconut water 25 ml	0	0	0	0	0	0	0	0
Jakaba 200 ml + coconut water 50 ml	8	10	17	16	16	16	16	16
Jakaba 200 ml + coconut water 75 ml	0	0	0	0	0	0	0	0
Jakaba 250 ml + coconut water 25 ml	0	0	0	0	0	0	0	0
Jakaba 250 ml + coconut water 50 ml	0	0	0	0	0	0	0	0
Jakaba 250 ml + coconut water 75 ml	0	0	0	0	0	0	0	0
	ns	ns	ns	ns	ns	ns	ns	ns

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Table 3

N, P, K, C-organic Content, and C/N Ratio of Different Jakaba–Coconut Water Treatment Combinations

Treatments	N (%)	P (%)	K (%)	C-organic	C/N ratio
Control	1.52	0.29	3.42	34.87	22.9
Jakaba 200 ml	1.49	0.32	3.73	34.57	23.2
Coconut water 50 ml	1.37	0.34	3.53	34.25	25.0
Jakaba 150 ml + coconut water 25 ml	1.54	0.38	4.79	34.06	22.5
Jakaba 150 ml + coconut water 50 ml	1.48	0.31	3.20	35.17	23.9
Jakaba 150 ml + coconut water 75 ml	1.42	0.31	4.08	35.47	25.2
Jakaba 200 ml + coconut water 25 ml	1.39	0.30	2.99	32.90	23.7
Jakaba 200 ml + coconut water 50 ml	1.43	0.34	3.70	34.32	24.2
Jakaba 200 ml + coconut water 75 ml	1.46	0.21	3.52	34.96	24.3
Jakaba 250 ml + coconut water 25 ml	1.64	0.34	3.25	34.94	22.0
Jakaba 250 ml + coconut water 50 ml	1.52	0.30	3.32	35.02	23.4
Jakaba 250 ml + coconut water 75 ml	1.33	0.31	3.00	34.51	25.9
p value	0.86	0.27	0.07	0.94	
	ns	ns	ns	ns	ns

Conclusions

The combined application of Jakaba fungi and coconut water effectively promotes flowering and fruiting in vanilla plants. The most effective treatment was 200 ml of Jakaba with 50 ml of coconut water. Further studies are recommended to optimize application techniques and dosage.

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