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## Research Article

# Impact of Phytogetic Feed Additive on Growth Performance Parameters in *Litopenaeus vannamei* Under Field Conditions

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## Abstract

**Background and Objective:** Adaptogens are plant substance that is known to enhance the productivity of animals mainly through their stress mitigating effects and hence the present study was undertaken with the main purpose to evaluate the effect of phytogetic feed additive (PHFA) on growth performance parameters in *Litopenaeus vannamei* under field conditions. **Materials and Methods:** The experimental shrimp for this study were post-larvae 10 (PL 10) and 112,000 shrimps were reared in two ponds (9.6 × 40 × 1.2 m). One pond served as the control group and was fed with a basal diet, the other pond was considered as a PHFA group fed with a basal diet plus Phytocee™ (2 kg/ton). The water quality parameters such as dissolved oxygen, temperature, pH, total ammonia nitrogen and nitrites were measured every day. Salinity was measured every 3 days. *Litopenaeus vannamei* shrimps were fed with respective diets for 104 days. **Results:** The total body weight (kg), FCR and survival rate (%) exhibited by control and PHFA groups were 1,108 & 1,145, 1.173 & 1.135 and 91.01 & 94.05, respectively. Results revealed that body weight (kg), FCR and survival rate (%) of *L. vannamei* were improved following the addition of PHFA at 2 kg/ton as compared to the control group. This could be due to the impact of individual ingredients which was already known to have adaptogenic, antioxidant and immunity-booster property. **Conclusion:** In conclusion, the addition of PHFA at the dose level of 2 kg/ton of feed could be recommended for the augmentation of the growth performance parameters of *L. vannamei*.

**Key words:** PHFA, *L. vannamei*, body weight, FCR, survivability, salinity, basal diet, adaptogenic

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**Competing Interest:** The authors have declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

*Litopenaeus vannamei* is one of the economic aquatic animals as well as the high market demand species among the faster-growing species. During the past decades, the white shrimp culture industry has changed rapidly from smallholders to an intensive industry with high stocking density to achieve high levels of production performance, which became a potential stressor to the animals causing disease outbreaks. In recent years, shrimp culture techniques and management practices have evolved, however certain infectious diseases and their associated mortality poses threat to the industry. The stress due to the altered temperature, salinity shifts, heavy metal toxicity, viral infection and various other pathogenic microorganisms are the crucial factors for shrimp-intensive farms that led to health deterioration, reduced performance and productivity<sup>1</sup>.

Stress is known to trigger parasitic diseases as well as a predisposing factor to non-infectious conditions such as swim bladder stress syndrome, coagulated yolk disease and various skeletal disorders. These stressors affect the growth and productivity of aquaculture animals<sup>1</sup>. Adaptogens are plant substances known to mitigate the burden of stress in animals. Various plants like *Withania somnifera*, *Ocimum sanctum*, *Panax ginseng*, *Tinospora cordifolia*, *Emblica officinalis*, *Bacopa monnieri*, *Rhodiola species* and *Terminalia chebula* has been reported to be adaptogenic<sup>2</sup>. In that context, a phytogenic feed additive (PHFA) is selected as it is known to possess adaptogenic, anti-stressor, hepatoprotection and immunomodulatory properties. Moreover, PHFA possesses a broad range of pharmacological and clinical benefits for the protection and restoration of health in poultry birds<sup>3</sup>. Furthermore, PHFA enhances the endurance and immune response of white shrimps for protection against WSSV and salinity stress<sup>4</sup>.

With these viewpoints, this study was conducted to evaluate the effect of PHFA on growth performance parameters in *Litopenaeus vannamei* under field conditions.

## MATERIALS AND METHODS

**Study area:** The study was conducted in white shrimp culture at Yancheng, Jiangsu province, China from August to November, 2021 (104 days). Phytocee™ is a PHFA developed by Natural Remedies Private Limited, Bengaluru, which was composed of dried powder of *Withania somnifera* stems and fruits of *Emblica officinalis* and whole plant of *Ocimum sanctum*. The formulation was standardized to contain a

known quantity of polyphenols and gallic acid. The experimental shrimp for this study was post-larvae 10 (PL 10) and 112,000 shrimps were reared in two ponds (9.6×40×1.2 m). One pond was served as a control group and fed with a basal diet, the other pond was considered as a PHFA group fed with a basal diet plus Phytocee™ (2 kg/ton). The water quality parameters such as dissolved oxygen ( $\geq 4$  mg L<sup>-1</sup>), temperature ( $28 \pm 1.0^\circ\text{C}$ ), pH (7.80-8.50), total ammonia nitrogen ( $< 0.05$  mg L<sup>-1</sup>) and nitrites ( $\leq 0.8$  mg L<sup>-1</sup>) were measured every day. Salinity (11 ppt) was measured every 3 days. *Litopenaeus vannamei* shrimps were fed with respective diets for 104 days.

## RESULTS

The results of the effect of PHFA on growth performance parameters in *L. vannamei* was represented in Table 1. Results revealed that body weight (kg), FCR and survival rate (%) of *L. vannamei* were improved following the addition of PHFA at 2 kg/ton as compared to the control group. The total body weight (Kg), FCR and survival rate (%) exhibited by the control and PHFA group were 1,108 and 1,145, 1.173 and 1.135 and 91.01 and 94.05, respectively.

## DISCUSSION

The present study was designed to evaluate the effect of PHFA on growth performance parameters in *Litopenaeus vannamei* under field conditions. Results of the field trial depicted that body weight (kg), FCR and survival rate (%) of *L. vannamei* were improved following the addition of PHFA at 2 kg/ton as compared to the control group. The observed higher body weight gain with lower feed consumption and mortality percentage was highly commercially significant since the trial was performed in field conditions. These results could be attributed to the adaptogenic, immunomodulatory and antioxidant activities of individual herbal ingredients present in the PHFA.

Literature reports evidenced that the beneficial effects of plant products are reducing the stress condition, serving as an appetizer, rendering antimicrobial activity as well as stimulating the immune system<sup>5,6</sup>. Herbal preparation plays a pivotal role in controlling diseases by exhibiting their antioxidant and antimicrobial activity<sup>7</sup>. Moreover, Indian medicinal plants possess antioxidant and immunomodulating properties<sup>8</sup>. The main advantage of herbal products was cost-effective with better accuracy in comparison with chemotherapeutic agents and provide a helpful solution to

Table 1: Effect of PHFA on growth performance parameters in *L. vannamei*

| Parameters                  | Control group | PHFA group | Commercial significance |
|-----------------------------|---------------|------------|-------------------------|
| Stocking density (Nos)      | 56,000        | 56,000     | -                       |
| Feed consumption (kg)       | 1,300         | 1,300      | -                       |
| Final body weight (kg)      | 1,108         | 1,145      | 37 Kg higher gain       |
| Quantity harvested (Nos/kg) | 46            | 46         | -                       |
| Feed conversion ratio (FCR) | 1.173         | 1.135      | 38 g less feed intake   |
| Survival rate (%)           | 91.01         | 94.05      | 3% more survival        |

The observed higher body weight gain (37 Kg) with lower feed consumption (38 g) and mortality percentage (3%) were highly commercially significant, as the trial was performed in field conditions

most of the problems that the aquaculture industry is facing today<sup>9</sup>. To ease the problems, herbs were supplemented along with diets as a mixture or as an individual supplement to the shrimps<sup>10</sup>.

*Withania somnifera* is known to improve swim endurance, reduce stress-induced cortisol concentrations, prevent stress-induced ulcers and improve immunity in animals<sup>11</sup>. *Withania somnifera* has been shown to improve growth, haemato-biochemical response and disease resistance of *Labeo rohita* against *Aeromonas hydrophila* infection<sup>12</sup>. Furthermore, Laltlanmawia *et al.*<sup>12</sup> reported that the inclusion of 1.0% *W. somnifera* root extract and L-ascorbic acid combination in the diet showed the immunostimulatory effect and attenuated the effect of multiple stressors *viz.* low pH and waterborne iron toxicity in *Labeo rohita* fingerlings.

Tiwari *et al.*<sup>13</sup> reported the beneficial role of *O. sanctum* on a *Clarias batrachus* (Linn.) in augmenting immunity, growth and survivability. Various research investigators revealed that the anti-stress active principles of *O. sanctum* are believed to be Ocimumosides A and B and Ocimarin<sup>14-16</sup>.

Sharma *et al.*<sup>17</sup> reported that *E. officinalis* reduces the number of free radicals and the extent of cellular damage and this antioxidant potential of *E. officinalis* could be attributed to the polyphenolic contents present in the extracts facilitating conjugation with free radical species. Furthermore, several research investigators reported the multiple effects of pharmacological and immunomodulatory properties of *E. officinalis*<sup>18</sup>. The above literature support as well as the results demonstrated that this polyherbal formulation has the potential to improve the overall productivity of *L. vannamei* by mitigating the impact of environmental stress in shrimp.

## CONCLUSION

PHFA addition at the dose level of 2 kg/ton could augment the body weight, enhances survivability and improves the FCR of *L. vannamei*. These conducive effects of PHFA could be attributed to the antistress,

immunomodulatory and antioxidant, properties of the phytoactive present in individual herbal ingredients in PHFA. Therefore, the addition of PHFA at the dose level of 2 kg/ton of feed could be recommended for the augmentation of the growth performance parameters of *L. vannamei*.

## SIGNIFICANCE STATEMENT

Adaptogens are planting substances known to enhance the productivity of animals through mainly their stress-mitigating effects. Hence, in the present study, we aimed to assess the effect of PHFA on growth performance parameters in *Litopenaeus vannamei*. This study revealed the scientific fact that the addition of polyherbal formulations having stress-mitigating effects could play a pivotal role in the augmentation of productivity of *L. vannamei*.

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