

# RESEARCH BRIEF

## IMMUNOLOGICAL AND GROWTH EFFECTS OF SPRAY DRIED PLASMA IN DIETS FOR JUVENILE WHITE SHRIMP *LITOPENAEUS VANNAMEI*



White Feces Syndrome is highly prevalent in SE Asia shrimp farms causing high mortality and reduced biomass yield. Soybean Meal (SBM) is commonly used in shrimp feed to reduce reliance on fish meal but is less digestible by shrimp and may contribute to poor pond water quality. Poor pond water quality propagates the growth of *Vibrio parahaemolyticus*, which is the primary pathogen associated with White Feces Syndrome and causes damage to the hepatopancreas. In addition, because the prophylactic use of antibiotics in shrimp feed is now restricted or banned in many shrimp producing countries, it is wise to find alternatives for promoting shrimp well-being and reducing severity of disease outbreaks without causing negative impacts on the environment or consumer's health. Functional plasma proteins in shrimp feed may improve diet digestibility and provide better immunity to support shrimp health and performance.

Spray dried porcine plasma (SDP) is a feed ingredient with a diverse mixture of functional proteins including albumen, globulin, transferrin, peptides, growth factors, and other components that improve diet digestibility, growth, feed efficiency, health, and survival in mammalian, avian, and aquaculture species.

The study objectives were to determine the effect of 0.0, 1.5, 3.0, 4.5 or 6.0% SDP replacing SBM in pelleted shrimp diets fed to post-larvae 12 (PL12) white shrimp *Litopenaeus vannamei* on growth, survival, protein efficiency (PER), feed efficiency (FCR), and immune responses during PL rearing for 45 days under controlled water temperature ( $29 \pm 1^\circ\text{C}$ ) and optimum water quality in fiberglass tanks (4 tanks per diet; 120 PL/m<sup>2</sup>; 80 shrimp/tank)

Major Ingredients	Control	1.5% SDP	3.0% SDP	4.5% SDP	6% SDP
Wheat Flour	25.00	26.35	27.70	29.05	30.40
Corn Protein Concentrate	4.50	4.50	4.50	4.50	4.50
Soybean Meal	25.00	22.15	19.30	16.45	13.60
AP 820 Porcine Plasma	0.00	1.50	3.00	4.50	6.00
Poultry Meal	20.25	20.25	20.25	20.25	20.25
Fish Meal	8.55	8.55	8.55	8.55	8.55
Shrimp Shell Meal	5.00	5.00	5.00	5.00	5.00
Other Minor Ingredients	11.70	11.70	11.70	11.70	11.70

On day 45, immune parameters were measured on 20 shrimp per diet. Also 30 shrimp per tank were kept for an additional 7 days to undergo challenge with *Vibrio parahaemolyticus* (105 CFU/mL; 96 hr-LD50) to evaluate post challenge survival. Five shrimp per tank were collected before challenge and 4 d after challenge for hepatopancreas histology and detection of infection.

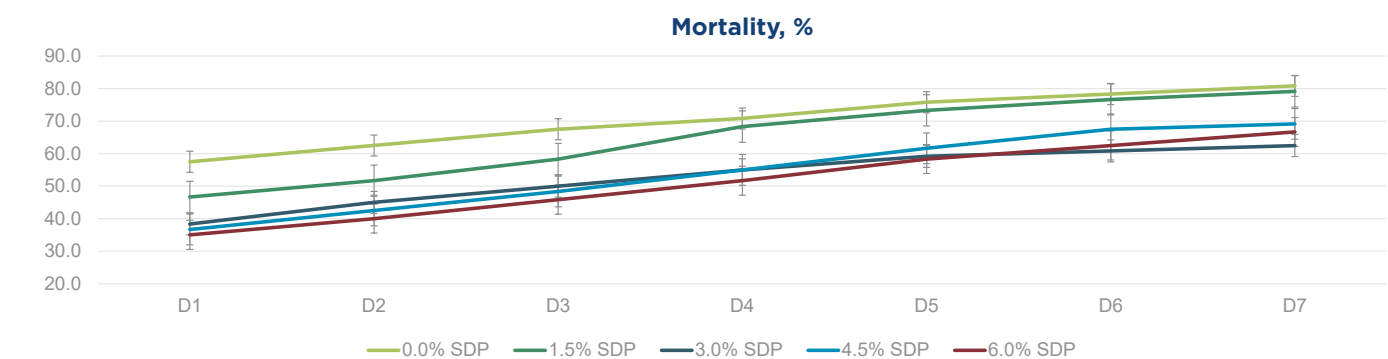
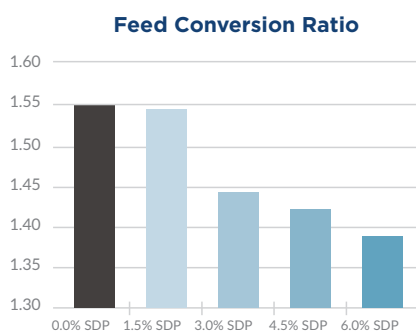
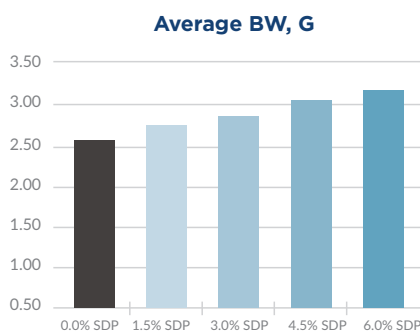
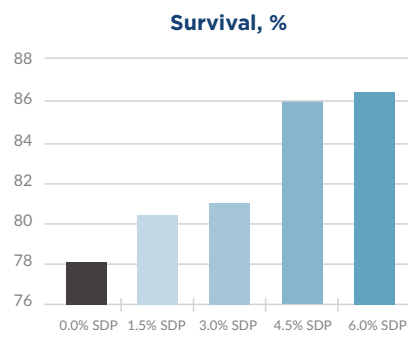
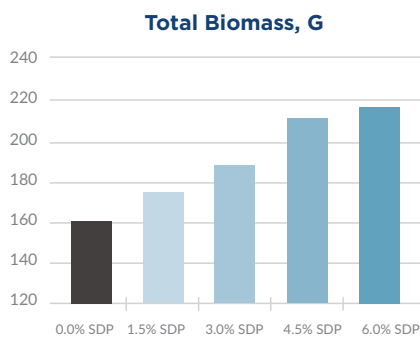
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Over the 45-day PL feeding study of shrimp under optimum water quality and temperature conditions, there was a linear ( $P < 0.01$ ) increase in biomass, average shrimp weight, survival, feed per shrimp, and PER and a linear ( $P < 0.01$ ) reduction in FCR for shrimp fed increasing levels of SDP. At day 45, total hemocyte count, phagocytosis (%), phenoloxidase activity and superoxide dismutase (% inhibition) increased as level of SDP increased ( $P < 0.01$ ). On d 4 after challenge, shrimp fed diets with 3.0, 4.5 or 6.0% SDP had lower ( $P < 0.05$ ) mortality compared to 0 or 1.5% SDP and hepatopancreas histology revealed less cell damage for shrimp fed 3 to 6% SDP.

## Plasma Performance

Spray Dried Plasma (SDP) is a highly digestible protein with significant benefits to the aquaculture industry. Research demonstrates SDP helps to improve diet digestibility, growth, feed efficiency, health, and survival in mammalian, avian, and aquaculture species.

Functional plasma proteins in shrimp diets can delay and reduce onset of mortality associated with an acute challenge with *Vibrio parahaemolyticus*, providing more time for shrimp to be harvested from ponds having White Feces Syndrome.



In conclusion, results suggest optimum growth, efficiency, and survival was achieved with a minimum of 4.5% SDP and a minimum of 3% SDP was needed for optimal immunity under high water quality conditions. Under challenge conditions, 3 to 6% SDP significantly reduced and delayed mortality. The SDP was shown to improve growth performance, survival, feed utilization, immune responses, and reduce the mortality of *V. parahaemolyticus*-infected Pacific white shrimp. Therefore, it could potentially be applied in shrimp farming as an alternative to antibiotics.

For additional information, contact the Sales or Technical Service teams.

Reference:  
Niti Chuchird et al., 2021 Effects of spray-dried animal plasma on growth performance, survival, feed utilization, immune responses, and resistance to *Vibrio parahaemolyticus* infection of Pacific white shrimp (*Litopenaeus vannamei*) <https://doi.org/10.1371/journal.pone.0257792>

