

Managing Moulting in Pacific White Leg Shrimp (*Penaeus vannamei*) Farming

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SUMMARY

Andhra Pradesh is the leader in shrimp production, with 5, 10,794 metric tonnes being produced in the state according to 2019-2020 MPEDA report. Much of the culture is contributed by *Penaeus vannamei*, and a small contribution by tiger prawn *P. monodon*. Shrimp grow by moulting, and an understanding of the moulting cycle leads to success in its farming. In spite of scientific reports farmers follow indigenous knowledge to understand moulting. In doing so they have also been successful. This article looks in the local practices and discuss them in terms of scientific analysis. It aims to provide basic information into issues of moulting and how to overcome it.

INTRODUCTION

The success of shrimp farming depends on four crucial factors seed, feed, environmental condition, and management. Lack of anyone factor can lead to a reduction in yield. Shrimp growth is based upon the capacity of muscle restoration after moulting. Shrimp body has an exoskeleton that is periodically shed off and a new exoskeleton grown. This process is called the moulting cycle. The quicker the growth, moulting needs be periodical. Moulting time can be considered as a critical tool for efficient management of the shrimp farm yield. Water quality can inhibit the moulting frequency and ultimately yield of the farm. An understanding of the stages of moulting by shrimp farmers is crucial for successful farming.

Moulting process in shrimp

Here, include standard no. of days shrimp take for each moulting start with stocking till harvest. Also tell about how it is matched with the lunar cycle by the farmers. That would be a useful information.

Stages of Moulting

There are five stages in moulting

Post-moult:

- Shrimp recovers from its previous moult
- Extends and merges its cuticle to its new size
- Occurrence of muscle fibre rearrangement and disappearance of dramatic muscle atrophy in abdominal muscle
- Absorbs a large volume of water
- New shell hardens within several hours

Inter-moult:

- The shrimp's cuticle becomes functional.
- It grows in mass
- Feeding activity is stable
- Abdominal muscle buildups in mass

Pre-moult:

- Shrimp prepares itself for the next moult
- Feeding activities decrease
- New cuticle becomes visible to the naked eye

Moult (ecdysis)

- Free from exoskeleton
- Absorbs a lot of water
- Rapid weight gain
- No feeding and sensitive



Exoskeleton shed off

Post-moult stage

- The physical barrier formed by the cuticle is not fully functional
- Shrimp utilises body reserves to harden and mineralize the weak cuticle
- There is a risk of diseases and dysfunction

Stages of moulting in shrimp

Stage	Postmolt		Intermolt	Pre-molt			Molt	Postmolt	
	A	B	C	D1	D2	D3	E	A	B
Duration	5%		40%	55%			/	5%	
Exo-skeleton	Soft / Hardened new cuticle		Hard cuticule	The new cuticle is not visible yet	The new cuticle appears	Interval between the old cuticle and the new cuticle	/	Soft / Hardened new cuticle	
Feeding activity	None / Weak		Maximal	Decreasing			/	None / Weak	

Source – Aquaneo by Techna

Common reasons for delayed shrimp moulting in shrimp farms

- The stress due to physio-chemical and biological parameters
- Lack of minerals during post moult period, results in incomplete animal exoskeleton formation
- Very high hardness leading to mineral deposition on the shrimp
- Lack of nutrition, especially amino acids and fatty acids in diet, leading to a decrease in the ecdysone hormone secretion in Y-organ, causing a negative impact on the moulting cycle.



Mineral deposition of Exoskeleton



Foam an indicator of High organic load in pond bottom which inhibits the shrimp moulting due to production of toxic Gases

Management practices in shrimp moulting

Moulting during the lunar cycle period

Moulting occurs during a monthly lunar cycle, the semilunar cycle of spring and neap tides which rhythms locally called the new moon and full moon.

Moulting through enhancing better water quality

If the water quality is poor, shrimp will not moult. Under such situations, water quality parameters (pH, alkalinity, hardness and toxic gases) are assessed and appropriate measures are taken to improve, resulting in timely moulting of shrimp.

Moulting through hormonal enhancement

The hormone plays a significant role in shrimp moulting (ecdysis). Amino acids and fatty acids enriched shrimp feed can stimulate the ecdysteroid/ecdysone hormone in Y-organ of shrimp, that could induce moulting.

Moulting through the positive stressor

Despite good water quality, if shrimp are not moulting, there is a need to stress the animal positively. For example, some farmers traditionally practice sudden water exchange, applying a mild dose of quaternary ammonium compounds in culture water to induce the animals to moult.

Measures to overcome problems in shrimp moulting in the farm

- During the new moon, astami (8th day after new moon), navami (9th day after new moon) and full moon periods observe the moulting status of shrimps in the farm
- To enhance the activity of the Y-organ, provide an amino acid supplement in feed, this promotes the secretion of ecdysteroid which leads to moulting
- Application of ethylene diamine tetraacetic acid (EDTA) with sodium bicarbonate (soda salt). EDTA is a chelating agent, which binds heavy metals, detoxifying the metal toxicity and soda salt stabilizes the alkalinity and hardness of water

CONCLUSION

Adoption of proper monitoring procedures to observe shrimp moulting behaviour would essentially provide better growth for shrimp farmers. In addition to the routine management practices adopted by the farmer, the inclusion of the lunar cycle in observing the moulting process would provide an easy management option for the farmers.

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