

Project Highlights

Growth of GI Macro II Strain in different locations²

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Introduction

A selective breeding program was conducted to improve freshwater prawns with the use of a synthetic population formed from numerous breeders collected from Tanjung Air (Bekasi), Kalipucang (Ciamis) and Musi (Palembang). The stock from Tanjung Air was collected in February 1995 with an average body weight of 70 g/pc. Individual selection was applied to this stock to increase its edible portion. The stock from Kalipucang was collected in June 1996 with an average weight of 72g. Index selection was used in this stock to improve growth rate and edible portion. After two steps of selection, the synthetic population was constructed from these two stocks and incorporated to the stock from Musi (ABW=75g, collected in May 1997). Family selection was then applied to the synthetic population. Thus, in 2001, a new breed of freshwater prawn has been developed and released to the farmers. This strain was the GI Macro or the Genetically Improved *Macrobrachium rosenbergii* (Emmawati *et al.*, 2001). This study was conducted to evaluate the capability or performance of GI Macro in different locations/environments. Growth of the GI Macro was evaluated in three different locations : low (<10 m), moderate (150-250 m) and higher (>250 m) than the sea surface level.

Materials and Methods

Spawning activity

About 1,800 breeders (average length = 22 cm) were selected from 18 families of the GI Macro II stock. Twenty five percent of the best size (in terms of length) from each family were used as the selected line while the 25% average sized prawns were used as the control line (50 male and 50 female per family). Each family is distinguished by means of plastic tags. These tagged stocks contributed to the breeders chosen for mass spawning.

A total of 900 breeders from each line (selected and control line) with 1:1 male and female ratio were mass spawned separately in 200 m² concrete pond for one month. Seventy female breeders with mature eggs from the selected line and 60 female breeders with the same condition from the control line were collected for the spawning and hatching.

The spawners were treated by dipping them in 1.5 mg/l malachite green for 20 minutes before placing them into fiberglass hatching tanks. The water temperature was kept at 29-30°C using thermostat heaters. Squid was given as food at 5% of body weight and the spawners were fed thrice daily.

Larval Rearing

Larvae were collected daily using net³ tray and were kept in the rearing tank at 100-150 fry/liter. Larvae collected in 10 days were pooled into one batch. Clean water system with 10-12 ppt salinity was used in this process. The 1-7 day old larvae were fed *Artemia* nauplii followed by egg custard containing 55% protein and 8% fat, seven times daily. Water was changed every three days when larvae were 1-7 days old, every two days for 7-15 day old larvae and then daily until the post larval (PL) stage.

³from the Report on the 2nd and 3rd Roundtable Discussion



Post Larval Rearing

About 24,000 larvae of the selected and control line were collected and reared in different concrete tanks provided with bamboo shelters. PL 10 *M. rosenbergii* were reared until they reach 3-5 cm in size in a concrete tank in the hatchery (stocking density = 400 PL/m²). The feed used was natural food (i.e. *Moina* and *Daphnia*), and pellets containing 38% protein at 20% of the prawns' body weight. Natural food was given once while pellets were administered four times daily.

Grow-out culture

M. rosenbergii juveniles (average size = 0.3g) were reared in *hapa* nets set in a pond at 85 juveniles/m². The juveniles were cultured in three different locations: Sukamandi (low level, <10 m), Cibalagung (moderate level, 200-250 m) and Cijeruk (high level, >250 m). Pellets containing 30-33% protein were given to the prawns at 20% of the biomass, four times daily for 1-3 weeks. At 4-8 weeks, feeding rate was 15% of body weight given four times daily after which feeding rate was 10% of body weight given three times (07.00; 12.00 and 16.00). Four sampling was done twice in a month while cleaning of the *hapas* were conducted every week.

Results and Discussion

The total length, standard length, body weight and survival rates of the different *M. rosenbergii* batches are listed in Table 1.

Table 1. Average total length (TL), standard length (SL), body weight (BW) and survival rate (SR) of *M. rosenbergii* batches

| Batch | Selected | | | | Control | | | |
|-------|----------|---------|-------|-------|---------|---------|--------|--------|
| | TL (mm) | SL (mm) | BW(g) | SR(%) | TL (mm) | SL (mm) | BW (g) | SR (%) |
| 1 | 2.833 | 1.753 | 0.19 | 93.3 | 2.807 | 1.650 | 0.19 | 93.0 |
| 2 | 2.987 | 1.800 | 0.19 | 79.0 | 2.467 | 1.467 | 0.19 | 48.0 |

The results showed that after over a month of culture, the average total length and survival rate of the selected line was higher than the control line. The average total length and survival rate of GI Macro varied between groups 1 and 2. This phenomenon indicates that population of GI Macro has wide variance in terms of growth and survival. The average total length and weight of juveniles when reared for three months in *hapa* within an earthen pond is listed in Table 2.

Generally, the average total length and weight of the GI Macro selected line was better than the control line in the three different locations. The selected line of GI Macro in Sukamandi grew slower than the control line during the six-week culture period. In Cibalagung and Cijeruk, the selected line of GI Macro grew faster than the control line. The data showed that the best harvest weight is GI Macro reared in Cibalagung (7.982 + 5.991g), followed by Sukamandi (4.698 + 3.287g) and Cijeruk (4.692 + 2.011g).

Results therefore indicate that GI Macro is more suitably reared in low to moderate levels than in the high sea level area. Water temperature was 30-32°C, 28-30°C and 24-28°C in Sukamandi, Cibalagung and Cijeruk, respectively. The water sources of three different locations are: natural water source for Cijeruk, and channel water from paddy field for Cibalagung and Sukamandi. The water sources may have also influenced the growth of the GI Macro.



Table 2. Average total length (cm) and weight (g) of GI Macro fry reared for 12 weeks in three different locations (standard deviation in brackets)

| Location | Collection | Initial | Week 2 | Week 4 | Week 6 | Week 8 | Week 12 |
|------------|------------|-----------------------|-------------------------|------------------|------------------|------------------|------------------|
| Sukamandi | Selected | TL = 2.910 (0.527) | 3.880 (0.695) | 4.568 (1.416) | 5.858 (1.416) | 6.858 (1.459) | 7.789 (1.775) |
| | | W = 0.189 (0.089) | 0.432 (0.259) | 0.773 (0.569) | 1.544 (1.365) | 2.774 (1.889) | 4.698 (3.287) |
| | Control | TL = 2.628 (0.742) | 4.328 (0.701) | 4.916 (1.142) | 5.628 (1.285) | 5.992 (1.299) | 7.606 (1.768) |
| | | W = 0.189 (0.089) | 0.568 (0.267) | 1.001 (0.864) | 1.648 (1.287) | 1.821 (1.272) | 4.320 (3.927) |
| Cijeruk | Selected | TL = 2.910 (0.527) | 3.976 (0.788) | 5.194 (0.999) | 5.944 (1.034) | 6.760 (1.239) | 7.990 (1.043) |
| | | W = 0.189 (0.089) | 0.514 (0.331) | 1.166 (0.779) | 1.782 (0.951) | 2.846 (2.653) | 4.692 (2.011) |
| | Control | TL = 2.628 (0.742) | 3.724 (0.609) | 4.718 (0.663) | 5.162 (1.150) | 5.944 (1.171) | 7.224 (1.193) |
| | | W = 0.189 (0.089) | 0.394 (0.910) | 0.776 (0.347) | 1.134 (0.851) | 1.641 (0.940) | 3.579 (2.052) |
| Cibalagung | Selected | TL = 2.910 (0.527) | 4.486 (0.870) | 5.642 (0.838) | 6.964 (0.961) | 8.138 (1.245) | 8.858 (1.859) |
| | | W = 0.189 (0.089) | 0.691 (0.357) | 1.218 (0.499) | 3.234 (1.333) | 4.880 (2.268) | 7.982 (5.891) |
| | Control | TL = 2.628 (0.742) | 4.196 (0.65) (0.545) | 5.820 (1.263) | 6.600 (1.237) | 7.506 (1.404) | 8.556 (1.727) |
| | | W = 0.189 (0.089) | (0.378) | 1.528 (1.040) | 2.384 (1.329) | 3.784 (2.275) | 6.648 (4.591) |

Length and Weight Gain

Generally, the length gain of GI Macro reared in three different locations for three months was positive (Figure 1). However, GI Macro reared in Cijeruk only showed positive tendency during the research period, while the negative value of the length gain was observed in GI Macro reared in Sukamandi and Cibalagung. A similar result was also obtained in the weight gain of the GI Macro (Figure 2). The positive value was observed in GI Macro reared in Cijeruk, while negative value in weight gain was observed in Sukamandi and Cibalagung.

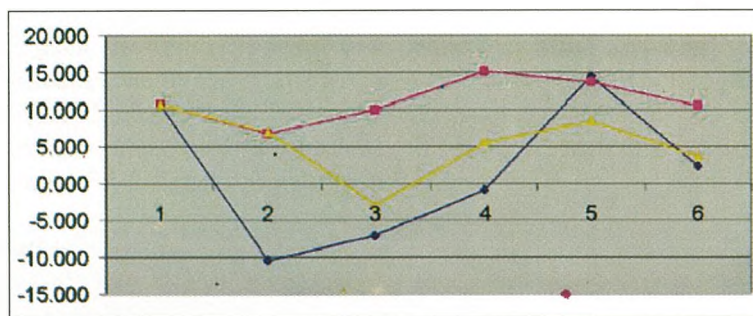


Figure 1. Length gain of juvenile GI Macro reared in three different locations (Blue = Sukamandi, Pink = Cijeruk, Yellow = Cibalagung)

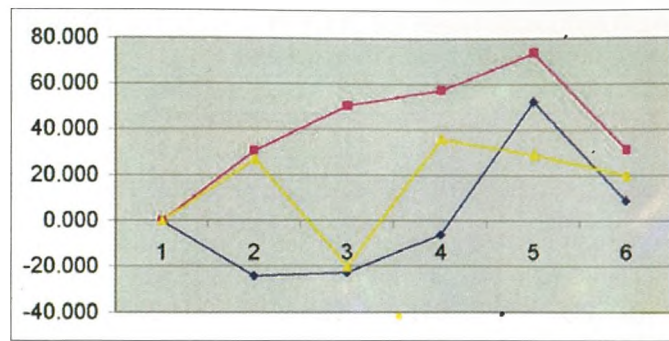


Figure 2. Weight gain of juvenile GI Macro reared in three different locations (Blue = Sukamandi, Pink = Cijeruk, Yellow = Cibalagung)

This shows that the selection has a greater effect on weight gain than in length gain. Weight gain upon harvest of the GI Macro reared in Cijeruk, Cibalagung and Sukamandi were 31.09%, 20.06% and 8.750%, respectively, while the length gain at harvest of the GI Macro were 10.6%, 3.53% and 2.4% in Cijeruk, Cibalagung and Sukamandi, respectively. The highest weight and length increments of GI Macro in each location were 52% and 14% for the Sukamandi stock, 73% and 15% for Cijeruk, and 8% and 35% for Cibalagung. Nugroho *et al.* (2005) noted that a wide variation of the GI Macro was also observed genetically using DNA markers, suggesting that another selection activity should be conducted to improve their variability as a pure line.

References

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