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REVIEWER'S REPORT

Manuscript No.: IJAR-53079 Date: 30-07-2025

Title: **EFFECT OF CROSSING BETWEEN TWO GENETICALLY DISTANT STRAINS OF CALLOSOBRUCHUS MACULATUS ON THEIR BIODEMOGRAPHIC PARAMETERS**

Recommendation:
Accept as it is

Rating	Excel.	Good	Fair	Poor
Originality	√			
Techn. Quality		√		
Clarity		√		
Significance		√		

Reviewer Name: Dr. Manju M **Date:** 31-07-2025

Reviewer's Comment for Publication.

1. Crossbreeding improves egg fertility and biases the sex ratio toward females but does not change overall fecundity.
2. Larval survival and development depend more on seed type and female-seed compatibility than on genetic factors.
3. Most eggs are laid early in the female's life, showing clear age-dependent fecundity patterns.
4. Crossbreeding reduces adult longevity, especially in females, likely due to genetic variability and reproductive costs.
5. Increased genetic diversity from crossbreeding may boost adaptability but could also speed up pesticide resistance, complicating pest control.

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Detailed Reviewer's Report

1. **Objective and Background**

   The study investigates the impact of crossing two genetically distant strains of *C. maculatus*—Barkedji and Fouta—on biodemographic parameters such as fecundity, fertility, larval survival, emergence rates, sex ratio, and longevity. Understanding these effects is important for improving pest control methods by targeting population dynamics

2. **Statistical Methodology**

- Data were compiled in Excel and analyzed using R version 4.3.1 at a significance threshold of 5% ($\alpha = 0.05$).
- Normality of data was assessed with the Shapiro-Wilk test. For normally distributed variables, ANOVA was used; otherwise, the Kruskal-Wallis non-parametric test was applied.

3. **Variation in Egg-laying (Oviposition) Activity**

- The average number of eggs laid per female varied among batches and seed substrates (Barkedji and Fouta).
- Batch 4 (FSFMBFe) on Fouta seeds recorded the highest mean number of eggs per female (57.5 ± 21.14).
- No statistically significant differences were found between batches (Kruskal-Wallis $p = 0.164$).

4. **Daily Pattern of Egg-laying**

- Egg-laying began on day 1 of female life, with peak oviposition occurring predominantly on day 2 for most batches.
- Exceptionally, batches 2 and 4 showed peak egg-laying on day 1.
- Egg-laying rates declined rapidly after the peak and became minimal or ceased after 4 days.

5. **Egg Fertility Rates**

- Fertility rates were consistently above 60% across all batches and substrates.
- Batch 5 (FSBMFFe) showed the highest fertility rate (76.94%), while batch 3 (Barkedji control) had the lowest (62.59%).
- Statistical tests indicated no significant differences in fertility rates among batches (Shapiro-Wilk p=0.1238; ANOVA p=0.148).

6. **Larval Survival Rates**

- Larval survival exceeded 75% in all batches, with slightly better survival on Fouta seeds (80%) compared to Barkedji seeds (78%).
- Highest survival was observed in batch 6 (Fouta controls) at 84.4%.

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- Differences between batches were not statistically significant (Kruskal-Wallis p=0.5428).

7. **Adult Emergence Rates**
   - Emergence rates varied between 49% and 62%, with Fouta control batches generally showing higher adult emergence than Barkedji controls.
   - Reverse cross batches (2 and 5) had the highest emergence rates (~61%).
   - No significant differences were observed between batches (ANOVA p=0.364).
8. **Sex Ratio Variation**
   - Sex ratios (male:female) differed among batches: control batches (3 and 6) were male-biased (>1), whereas crossbred batches (1, 2, 4) were female-biased (<1).
   - This suggests the possibility of genetic or substrate effects on sex determination or survival.
9. **Duration of Embryonic Development (Oviposition to Emergence)**
   - The average development period was about 21 days across all batches, with no significant differences found (Kruskal-Wallis p=0.3534).
   - Control batches had slightly longer durations, but this was not statistically meaningful.
10. **Adult Lifespan Differences**
    - Females consistently lived longer than males across all batches.
    - Control batches generally exhibited longer adult lifespans than crossbred batches.
    - Significant lifespan differences were observed between some batches, particularly for males from batch 5 versus batches 4 and 6, and for females between batch 3 and batches 1 and 2.
11. **Total Development Cycle Length**
    - Total lifecycle duration (from egg-laying to adult death) varied by batch and substrate.
    - Control pairs had the longest cycle (~31.4 days), with crossbred batches generally shorter.
    - Statistically significant differences were noted between batch 1 and batches 3, 4, and 6.
    - No significant differences were found between the control batches of Barkedji and Fouta seeds.
12. **Overall Conclusion**

    The study indicates variability in reproductive and developmental parameters of *C. maculatus* related to seed substrate and crossbreeding status. However, most measured differences were not statistically significant, except for adult lifespan and total cycle duration between certain batches. These findings highlight potential influences of genetic background and environmental substrate on population dynamics.

13. Significances of the study
    - The study shows that crossbreeding influences sex ratios and lifespan of *C. maculatus*, which can affect population growth dynamics. Understanding these

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effects helps design better targeted control methods by anticipating how genetic diversity alters pest populations.

- Females perform better on seeds from their natal environment, indicating strong host preference. This insight highlights the importance of considering host plant origin in pest control, allowing strategies that exploit these preferences to reduce pest survival and reproduction.