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WEIGHT LOSS AND SURVIVAL OF *BIOMPHALARIA GLABRATA* DEPRIVED OF WATER

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Immature and mature Biomphalaria glabrata *are kept out of water at relative humidities varying from 0 to 100%. When snails are submitted to a saturated atmosphere, they show a slow weight loss and survival may be long. If relative humidity (RH) decreases, weight loss becomes important and survival is short. A reduced RH (0 to 65%) produces similar effects. During desiccation, fasting has no noticeable effect; survival depends essentially on weight loss.*

Key words: *Biomphalaria glabrata* – desiccation – weight loss – survival

When adults *Biomphalaria* snails are kept out of water at high relative humidity (RH), they may survive a long time: Olivier (1956), Olivier & Barbosa (1956), von Brand, McMahon & Nolan (1957), Sturrock (1970), Jong-Brink (1973). Contrary to a common assertion, it is the same for immature snails (Vianey-Liaud & Lancastre, 1986). At high RH, the total body weight of snails decreases slowly. If RH is not saturated, the weight loss becomes important and survival is short.

This paper intends to compare the weight loss and survival of mature and immature *Biomphalaria glabrata (B.g.)* submitted to a wide range of controlled RH.

MATERIAL AND METHODS

We use a Brazilian strain of *B.g.* Two size classes are considered:

– immature snails (mean diameter from 7 to 8mm)

– mature snails (mean diameter from 12 to 13mm).

Groups of snails are put in a plastic jar. This jar is laid down in a larger one, sealed with mineral jelly, containing different substances producing various RHs (Solomon, 1951; Winston & Bates, 1960):

– potassium hydroxyde pellets: RH = 0%

– saturated solution of calcium chloride: RH = 32.5%

– saturated solution of sodium nitrite: RH = 65%

– distilled water: RH = 100% (saturated atmosphere).

Snails are maintained in artificial light (12L/12D) at constant temperature: 20 ± 1°C.

RESULTS

Immature snails – Results for RH = 0% and 32.5% are given in Table I.

Weight decreases rapidly and survival is less than to two days.

At RH = 65%, weight loss is not so quick but survival rate remains low (Table II).

On the contrary, at saturated atmosphere weight loss is slow: 21.2% during six weeks, and 80% of snails survive.

Mature snails – Mature *B.g.* submitted to RH = 0% easily survive three days. For longer duration, survival decreases rapidly and is of no value after eight days. Results are close relative with RHs = 32.5% and 65%. No snail survives more than a week (Table III).

Many experiments of various duration have been made in saturated atmosphere. For example, during six weeks, the weight loss is 5.9% and survival superior to 90%.

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TABLE I

Weight loss and survival of immature *B. g.* at RHs 0 and 32.5%

Time (hours)	RH = 0%		RH = 32.5%	
	Δ weight (%)	Survivors (%)	Δ weight (%)	Survivors (%)
8	23.1	100	–	–
18	27.7	80	–	–
24	33.4	90	41.1	100
30	45.2	40	39.2	60
36	48.7	30	50.4	30
42	54.2	10	49.2	20
48	56.4	0	54.3	0

TABLE II

Weight loss and survival of immature *B. g.* at RH = 65%

Time (days)	Δ weight (%)	survivors (%)
1	28.6	30
2	40.9	0
3	51.7	0
4	54.1	10
5	58.2	0

TABLE III

Weight loss and survival of mature *B. g.* at RHs = 0, 32.5 and 65%

Time (days)	RH = 0%		RH = 32.5%		RH = 65%	
	Δ weight (%)	Survivors (%)	Δ weight (%)	Survivors (%)	Δ weight (%)	Survivors (%)
1	21.2	100	30.5	100	15.5	100
2	32.9	100	31.7	100	20.0	100
3	40.5	100	38.2	80	30.2	90
4	42.6	50	44.1	40	32.8	60
5	48.5	20	44.7	40	34.5	80
6	52.5	20	48.5	20	40.5	0
7	54.2	10	52.6	0	–	–
8	56.8	0	–	–	–	–

TABLE IV

Weight loss of immature and mature *B. g.* at various RHs.

RH (%)	Immature Snails		Mature Snails	
	Weight loss during the first day (%)	Weight loss/day (%)	Weight loss during the first day (%)	Weight loss/day (%)
100	–	from 0 to 42nd day : 0.48	–	from 0 to 42nd day : 0.14
65	28.6	from 1st to 5th day : 7.24	15.5	from 1st to 6th day : 4.88
32.5	41.1	from 1st to 2nd day : 13.21	30.5	from 1st to 7th day : 3.82
0	33.4	from 1st to 2nd day : 23.02	21.2	from 1st to 8th day : 4.73

Weight loss during desiccation – Table IV shows a comparison of the weight loss in immature and mature snails during the first day of desiccation and the daily weight loss following the first day through the length of survival.

DISCUSSION

Immature snails submitted to RHs 0, 32.5 or 65% survive out of water during a short time: survival never reaches two days. On the contrary, in saturated atmosphere (RH = 100%), survival easily goes beyond 42 days.

Mature snails show a higher resistance to dry keeping. They survive several days in reduced RH. As for immature, survival is good when atmosphere is saturated, which confirms the observations of von Brand (1957) and also those of Olivier (1956), Olivier & Barbosa (1956), Sturrock (1970) and Jong-Brink (1973) obtained at RH near 90%.

In the two size classes, there is a great difference between snails maintained in saturated atmosphere and those submitted to a water vapor deficit. The level of this deficit does not seem to be important and produces similar effects. Snails are highly resistant when RH is maximum.

Whatever the RH, snails show a decrease of total body weight.

It appears that, for the same RH, weight loss is superior in immature than mature *B.g.* Weight loss is always important during the first 24 hours of desiccation and then continues, but at an inferior rate.

During desiccation snails do not eat. This starvation has probably a slight effect on resistance of snails. Submitted to a water vapor deficit, snails die before fasting produces a noticeable effect on snails starving into water (Vianey-Liaud, 1979, 1980). Moreover, snails kept out of water at saturated atmosphere, while starving and showing a higher loss of weight, are more resistant than those starving into water (von Brand, McMahon & Nolan, 1957; Vianey-Liaud, 1984).

An important weight loss is not directly linked to a reduced survival. Snails may resist to a strong and rapid decrease of weight. For example, all immature *B.g.* survive 24 hours at RH = 32.5% while the weight loss oversteps 40%. Snails die only if they remain in the reduced RH. An important but short weight loss has no significant effect; it becomes unfavourable for snails if it is of a long duration.

RESUMO

Biomphalaria glabrata maduros ou imaturos são mantidos fora da água, variando a umidade de 0 a 100%. Quando caramujos são submetidos a uma atmosfera saturada, sofrem uma lenta perda de peso e a sobrevivência pode ser longa. Se a umidade relativa decresce, a perda de peso será importante e a sobrevida será abreviada. Uma umidade relativa de 0 a 65% pode produzir efeitos similares. Durante a dessecação, a privação de alimento não tem efeito notável, a sobrevivência dependendo essencialmente da perda de peso.

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