

Kwashiorkor, cotton and grasshoppers

How the use of pesticides in cotton production impacts the diet of children in Sanambele by contaminating a valuable source of protein

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Abstract: Grasshoppers are an excellent source of protein and part of the diet of children in Sanambele, Mali. Recently, due to the effects of pesticides used in nearby cotton production, children are not allowed to consume grasshoppers anymore. This change in diet is of concern in this study as we are investigating the nutritional values of grasshoppers and their significance in children's diet. Previous studies have found that 21% of children are at risk for Kwashiorkor, a disease deficient in complete protein, and removing a potentially significant source of protein from the diet could affect their health adversely. Even though insects provide up to 10% of the protein consumed in some countries in Africa, we have found that the amount of insects to be consumed does not impact the diet of children in Sanambele significantly, rather the concern emerging out of this discussion was the imminent risk of pesticides used in cotton production threatening the health of all villagers of Sanambele potentially causing more health related issues than defined by malnutrition. We have also identified solutions for reducing the risk of Kwashiorkor and limiting the exposure to pesticides in the environment.

About the author

My name is Dana Fejes and I am a senior in Biology at MSU Bozeman. I immigrated to the U.S. from Germany 4 years ago and have gone through much paperwork to finally become a dual citizen. I am familiar with living in two different cultures, each of which is unique, yet similar. As often as possible we try to visit my country and celebrate many German traditions here in the United States. I live with my husband and young daughter near Bozeman, Montana and enjoy the quality of life this area provides for us. After finishing undergraduate studies I would like to pursue a PhD in the field of Biochemistry, because I am fascinated by the chemistry that is happening in our body that keeps us alive. Being an educated mother, health is of great concern to me and I do everything I can to live and eat as healthy as possible, raise my daughter in a loving and healthy environment and to give her the best she deserves. Contamination is not alien to us here either. Everywhere we look, we are surrounded by toxic chemicals and unhealthy environments. It is up to us to be informed to make wise choices about our lives and especially that of future generations. Becoming a parent has given me the most insight on what is important in life.

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Introduction

Mali is a country in West Africa populating roughly 12.6 million people in an area twice the size of Texas. In comparison, there are 24 mil people living in Texas, but is it not surprising that only 12 million people inhabit Mali, since 60% is comprised of desert. The capital of Mali is Bamako, which is located in the south west corner of Mali. One of our study sites was located in Sanambele, which is 50 miles south of Bamako. Currently Mali's annual export is made up 75-80% livestock and cotton (Wikipedia.org, 2009). In fact, most of Mali's production is in the agricultural sector with 80% of Malians farming (Ayittey, 2008). Just why the amount of livestock export is so high when hunger is still a pressing issue in Mali is unclear to me, but when Dr. Dunkel's research group questioned Sanambeleans in 2005 about their greatest concerns, hunger was ranked second after Malaria (Dunkel, 2009). There has been great effort accomplished in fighting Malaria in Sanambele, but after Dr. Dunkel visited in Fall 2009, there have recently been two cases of Kwashiorkor and another 21% of children under three years



Children in the village of Zantiebougou, Mali exhibiting signs of Kwashiorkor

old in the village were still at risk for Kwashiorkor. (Dunkel, 2009) Kwashiorkor is a protein deficiency with clinical symptoms such as a light hair patch in the back, protruding belly, edema (swelling) and decreased muscle mass among other symptoms. (Medline Plus, 2009) Protein

deficiency can be an issue in developing countries especially when the proper balance of nutrition is not met. Kwashiorkor in particular occurs when the diet consists of incomplete protein. Incomplete protein, as the name implies, lack the essential amino acids the human body

needs. Even though children may eat well and feel full after a meal with sorghum and chicken broth, when complete proteins are missing in the diet, the body is not able to synthesize specific enzymes necessary for metabolism. In Appendix I a list of essential amino acids is listed that are found in complete proteins. Children in Sanambele eat mostly sorghum, millet, rice, corn, tomatoes, carrots, cowpeas and peanuts. Of these, only cowpeas and peanuts provide some form of complete protein. Additionally, cowpeas are not always available due to harvest season and storage problems. One other main source of essential protein for young children comes from orthoptera, especially grasshoppers. In Sanambele two species of grasshoppers have been observed, *Oedaleus senegalensis* and *Kraussaria angulifera*.



Oedaleus senegalensis

Though there seemed to have been an improvement about the hunger issue since 2005, just recently a new challenge has come up that could potentially through back the progress made regarding hunger. Women of Sanambele have discouraged their children from consuming grasshoppers due to their concern of contaminated insects by pesticides used in the surrounding villages. As mentioned earlier, cotton make up a large proportion of export in Mali and villages like Sanambele are no feeling an impact of this export product possibly in the health of their children. In order to grow cotton especially in the amounts demanded for export and for the process of harvesting, pesticides are being used. The presence of pesticides in the environment contaminates other species, such as the grasshopper which in turn in an important protein source for children in Sanambele. Most commonly grasshoppers are consumed by children ages 5-12

since that is the age when they are out in the field helping adults and collect grasshoppers as a fun activity and food source. Because of this link I hypothesize that **current cotton production practices in the Sanambele area could increase the number of children between 5-10 years old at risk for Kwashiorkor.**

Methods and Materials

For this research to be effective we needed to start at the root of the problem: The village of Sanambele. In 2005 Dr. Florence Dunkel and her research group visited Mali and asked them what their main concern were and what needed to change in order to reach their goal. According to Savory and Butterfield (1999) the holistic goal needs to be addressed to identify problem and issues that matter to the people that are affected. They summed up that “quality of life, forms of production and future resource base goals had to be combined into one comprehensive, holistic goal.” Before this research paper has taken any shape, we asked the villagers of Sanambele about their holistic goal. Dr. Dunkel provided a summary of the results in class and the primary concern was death through Malaria and hunger was the second highest concern. These were the issues that Sanambeleans wanted to address to achieve have their own holistic goals. Significant process has been made in fighting Malaria since that concern was expressed. With this research I focused on hunger and especially Kwashiorkor, which is a protein deficiency mostly seen in children. When Dr. Dunkel returned to Mali in 2009, she was able to interview Howa Kuliba, who is the midwife and nurse in the village. Part of her responsibilities include prenatal, postnatal and neonatal care as well as monitoring young children, up to 36 months old, for Kwashiorkor. (Dunkel, 2009) There is also the women’s association who addresses many issues

as well as the elders who come together to make decisions regarding all aspects of life in the village. Most of the personal information was compiled through weekly meetings and interviews with Dr. Dunkel and when she traveled to Mali in 2009 I was able to submit a questionnaire that she asked participating members in the village. Another excellent resource was Kariba Coulibaly who is a scientist at l'Institute d' Economic Rurale in Sikasso, Mali. I connected to him through email contact. He is very familiar with Sanambele and MSU Bozeman because of his visits. I also used several search engines with peer reviewed articles including CAB, JSTOR and google scholar. I searched for terms like "Kwashiorkor", "cotton", "pesticides", "malnutrition", "Mali" and "grasshoppers" as well as combinations of these terms. See Appendix II for detailed hit results. The library at MSU Bozeman had more access to journals which I utilized as well.

Besides all this first hand and peer reviewed information I also integrated the nine authors in this research because they have had valuable information regarding addressing and resolving issues in Africa. There were several internet sites that provided nutritional information that I needed to correctly match nutritional requirements with needs as well as find the nutritional values of grasshoppers. Between the different sources of information I was able to conduct and conclude the issue I addressed in the beginning.

Results

When searched for "Kwashiorkor" and "Mali" in Google scholar I got 593 results. Whenever I used Sanambele in combination with hunger or kwashiorkor any search, no results were returned. "Hunger" and "Mali" returned 18,200 results and when I added "grasshopper" to

that search I got 414 articles. The specific search for “grasshopper” and “Kwashiorkor” returned only 93 hits.

Cotton production is one of the major exports of Mali and according to Keriba Coulibaly there are cotton fields as close to 50 meters from the houses. (Coulibaly, 2009) Because cotton is an export product it needs to be produced in economically large amounts and in order to harvest it, pesticides are often used. Previously, organochlorous pesticides such as DDT have been used in Mali, which have significant health effects, but more recently they have switched to organophosphorus pesticides, which are less harmful (Duke University 2009; Coulibaly, 2009). In the United States about 70% of insecticides are organophosphorus based and according to a case study done by Body Burden these pesticides can interfere with the nervous system by blocking the chemical transmitter Cholinesterase (ChE) and could possibly lead to several symptoms such as nausea, headaches, compulsions and death. (PANNA, 2009) Especially children that live in rural areas are at greater risk for exposure to these pesticides because they get in contact with the soil, pesticide drift and even breast milk from mothers that work in the cotton fields. Even low exposure to that type of pesticide has shown adverse effects in neural development. (Eskenazi et al. 1999)

Armed with the knowledge of risks, women of Sanambele have recently prohibited their children to consume grasshoppers. Grasshoppers were generally consumed by young children when they were old enough to walk, play in the fields and catch grasshoppers for fun and as a snack. (Dunkel, 2009; Coulibaly, 2009) Grasshoppers are rather a fun exercise to catch and a nutritious treat for these children. The protein content of grasshoppers varies among their species. One study in Mexico found that the protein content could vary greatly and more than half of the studied orthoptera contained more than 50% protein. (Ramos-Elorduy, 1997)

According to the Institute of Medicine, adults should take in about 0.8grams of protein per kilogram of body weight per day. For children ages 4-13, the amount increases to 0.95grams/kg body weight/day and infants between 1 and 3 should take 1.1grams/body weight/day (2003& Appendix III). The average child between 5 and 10 years old weighs between 17 and 34 kilogram respectively (Kuczmarski, 2002). On a different table (Appendix IV) the Institute of Medicine averaged that 4-13 year olds should get 19-34grams of protein per day and children in Sanambele are very active during the day. As

soon as they turn 5 years old they help carrying the babies. (Dunkel, 2009) Because of the circumstances these children are on their feet all day, play, help out and walk everywhere they go, which increases nutritional requirements. Iowa State University



A young child carrying an infant in Sanambele

summarized some data provided by Dunkel and Berenbaum and created a table for the nutritional values of grasshoppers which were the following: Small grasshoppers contain 14.3 grams of protein per 100 grams of insect and large grasshoppers contain 20.6 grams of protein per 100 grams of insect (Dunkel, 1996). This is only an average and as we have seen earlier, the protein value of each insect varies on the species. We know of two species present in the area: *Oedaleus senegalensis* and *Kraussaria angulifera* which are fairly large species. The dry weight of *Oedaleus senegalensis* averages for males around 0.116 grams and females 0.313 grams (Peterson, 2008 & Appendix V). For nutritional requirements we use the wet weight instead, where males weighs on average 0.364 grams and females 0.688 grams. Thus, on average one female grasshopper contains 0.1376 grams of protein and a male 0.07 grams of protein. In order

to fulfill the daily protein intake if *Oedaleus senegalensis* was the sole protein source, a 5 year old child would have to catch and consume 138 females or 271 males. A 10 year old child would need to consume 247 females or 485 males. Of course, insects are not the sole source of protein, but insects can make up 10% of the animal protein consumed in some countries of Africa. Of the



Children chasing grasshoppers in Africa

previously calculated numbers, grasshoppers would have to be consumed at a rate of 13-48 a day depending on age of the child and sex of grasshopper (DeFoliart, 1999; Coulibaly, 2009). The diet of children consists of a variety of foods, including protein rich sources. Common foods in Sanambele are millet, rice, corn and sorghum that are all rich in starch and fiber. Additionally fruits and vegetables like oca, tomatoes, carrots, lime and mangos are available. The protein rich sources

include cowpeas and peanuts and some meats. Many children do not eat much meat because of its scarce availability and the lack of appreciation children presumably show to this exclusive dish (Dettwyler, 1994). Occasionally, children get the knuckles of a chicken to chew on. (Dunkel, 2009)

When Dr. Dunkel visited the village in 2009, the reported statistics for children at risk for Kwashiorkor were 23%. These statistics only monitored children ages 0 to 36 months, but they allow extrapolation. Two children (2%) fewer than 3 years old were diagnosed with Kashiorkor, but were treated with a special sweet dish and recovered. An additional 19 (21%) children were at risk for Kwashiorkor and 71 (77%) children were healthy. (Dunkel, 2009) According to Keriba Coulibaly there have been no deaths reported due to hunger in 2009.

Discussion

Eating grasshoppers has never posed questions regarding health issues in Sanambele nor has it been identified for be a significant source of protein until recently. Dr. Dunkel has visited Mali for over ten years and in all these years children have always consumed grasshoppers as an extra snack. During her most recent trip to Sanambele in 2009, she found out that children were prohibited to eat grasshoppers because of the insecticides used in nearby cotton fields. This raised the question whether or not this reduction in protein rich food source would put more children at risk for Kwashiorkor, especially those between ages 5-10 since grasshoppers are mostly consumed by that age group.

According to Keriba Coulibaly there have been no deaths reported due to Kwashiorkor and the children at risk for Kwashiorkor was at 21%. One promising sign of absence of this disease was that only 2 out of 92 children ages 0-36 months were actually diagnosed with Kwashiorkor and recovered. Even though there are still 21% of children at risk, we do not know what exactly determines this classification. This might be of further investigation through an interview with the midwife who tracks these cases. We also found out that most off the diet in children consists of millet, rice, other vegetables and cowpeas amongst others. For one, grasshoppers only play a secondary role in nutritional protein sources and two they would have to be consumed in large amounts in order to make an impact. According to the data recovered in the results, we have found that grasshoppers are very light and despite their excellent protein content, they would have to be consumed in large numbers to substantially impact the children's diet. Despite these findings, I do believe that grasshoppers are an excellent supplement and not to be neglected as an additional and very valuable protein source.

The more pressing issue that surfaced during this investigation is the health aspect not only for children, but adults as well. Africa and especially Mali, has been producing cotton for decades and with that production came along the use of pesticides. The annual export of cotton in Africa is an astonishing \$2.1 billion worth, which is the second largest cotton exporter after the United States. (Rosenberg, 2009) As mentioned previously, DDT was used as an insecticide for years before they switched to a less harmful pesticide which is still very toxic. This issue did not just surface, it was only in the year of 2009 that Sanambeleans decided that grasshoppers were contaminated. For decades, these insects have been eaten and probably have been contaminated posing the question at what health risk many villagers in Mali and all of Africa are. Because of the relatively insignificant amount of grasshopper consumption the total amount of organophosphorus pesticides taken in might not be as significant either given that cotton fields are so close to the houses that all villagers, young and old, could get in contact with that chemical. Considering the logistics, amounts and practices, I don't think that the non consumption of grasshopper due to the cotton fields would put children at greater risk for Kwashiorkor. Rather I would be concerned that cotton practices in general pose a great risk for farmers in all of Africa, but that is beyond the scope of this research project.

The new trend to globalization towards economic wealth and profitable agriculture always brings great risks with it. When Helena Norberg-Hodge visited Ladakh for the first time, there was no pollution, no poverty and no waste. When she returned eight years later, due to Western influence, a lot has changed. The air was polluted through automobile traffic, the culture was disappearing quickly and the original sustainable farming was essentially non-existing. (Norberg-Hodge, 1991) It seems as if new profitable practices pose more risks that benefit to rural, traditional sectors like Sanambele and Ladakh. A small agricultural village like

Sanambele should be able to live in traditional ways that utilizes the land not abuses it. Because Mali exports most off their cotton, this production is not meant for the local villages, rather for the global market. Villagers of Sanambele have made their own clothing before, but not on such a large scale. This contradicts many voices that suggest direct farmer first approaches, meaning the farmers have the knowledge or can obtain the knowledge and tools to perform sustainable farming that suits their environment and needs. (Chambers et al. 1989)

The usage of pesticides has now made a direct impact on children in Sanambele and possibly the entire population of that village. Instead of small farming, cotton field are used for export, benefitting the locals only with money, but at the cost of their health. Initially the question was raised whether or not grasshoppers provided a sufficient source of protein and if that was to be removed from their diet, if it would eliminate one of the few protein rich sources. There are other protein sources, which are available in greater amounts than grasshoppers provide. Overall the effect grasshoppers have on the diet of children in Sanambele seems to be minor and a removal of that source has not shown a significant increase in malnutrition or other hunger related diseases.

Conclusion

After gathering a lot of information on nutritional values of grasshoppers, especially the two species commonly found in the Sanambele area, interviewing people directly connected to the village and connecting the dots between grasshoppers and cotton practices, I found that cotton production itself does not put children between ages 5-10 at greater risk for Kwashiorkor due to the lack of insects in their diets. The amounts children would have to eat are much larger

and since eating grasshoppers is more of a game and supplemental food source, the amounts are not significant. However, due to cotton production in the area, the risk of exposure to insecticides is not to be neglected. As Keriba Coulibaly stated, cotton fields are very close to the houses and through the use of pesticides, there is a good possibility of not only grasshoppers being contaminated, but the soil and water as well. These findings are definitely worth to further looking into since this is an ongoing problem. It is unfortunate that current export practices are impacting these remote and traditionally rich villages like Sanambele. The idea is to give them input and provide ideas, but not to overthrow western ideals on this precious culture. That is a major concern for Calderisi that the large amount of foreign aid is not helping Africa, rather slowing down its political process and Africa does not need money, but “breathing space” (Calderisi, 2006). By producing cotton for export this very concern is made worse. Cotton was produced in Africa before it was exported, but the introduction of pesticides to increase yield was an outside act. Even though there are natural herbicides that could potentially be used in cotton production, there seems to be more concern about the amounts produced over health issues in the population. This is one more example why “helping” Africans with modern technology, such as synthetic pesticides, is turning out to be a potential “nightmare”. One quote by Yunus comes to mind when looking at the big picture: “Globalization is like a hundred-lane highway crisscrossing the world. It’s a free-for-all highway; its lanes will be taken over by the giant trucks from powerful economies.” (Yunus, 2007) This is exactly the point. Cotton export is not going to benefit villagers of Sanambele even it provide some form of monetary income. This global economy takes what it needs, where it can be produced for the lowest cost and drives off with the product, leaving behind the small farmers who are paying the price.

If cotton production was only used for local farming needs, the use of pesticides could be eliminated or reduced to a natural form even if that works less efficient. The exposure to pesticides poses a great risk to all villagers of Sanambele, not just the children. By not being able to eat grasshoppers, some of the direct contaminated contact may be prevented, but that does not solve the risks eliminate the overall exposure to chemicals. Sanambele has great potential to remain a traditionally rich and healthy village. In the fight against Malaria, there are natural insecticides used to control mosquitoes and physical measurements are taken such as bed nets, neither of which poses any health risks to the people.

As mentioned earlier, the use of pesticides is a common and global issue since especially in developed countries these chemicals are around and enter our systems. Due to the enormous food consumption in developed countries, using chemicals to increase yield, longevity and production is a major issue here as well. The demand is so large that traditional practices fail to meet the requirements and are being overrun by larger, less healthy means of production that are able to meet the requirements. Eating organic foods is one way to avoid the exposure or intake of pesticides, but there are so many chemicals in the environment that it is almost impossible not to get exposed to some sort of synthetic. The key for the village of Sanambele is to keep their crops as healthy as possible to ensure a good and healthy harvest.

Malaria was a major problem causing many deaths in 2005 and in 2009 there have been no deaths recorded due to Malaria. (Dunkel, 2009) A similar trend seems to reveal with the second most pressing concern of 2005, which was hunger. According to Coulibaly, there have no deaths been recorded due to hunger in 2009. As we see in these statistics, progress has been made, but new problems arise as well. Harmful pesticide use against mosquitoes or in cotton fields could create new health problems. Infectious diseases are still a major killer in developing

countries for many reasons. The important key is to monitor progress, evaluate the holistic goal of the village and seek solutions that are within reasonable range for the villagers and works towards their holistic goals, not the one set by others.

Recommendations

These are the recommendations I have for reducing hunger related issues in Sanambele:

- The use of natural herbicides may be recommended to keep that goal. As long as the area of Sanambele is safe for growing crops, the issues of contaminated grasshopper would be dismissed as well.
- Another source of protein for children would be to provide some meats for them since meat is an excellent source of protein. If the idea was brought up to the elders and women in the village about nutritional requirements for children, especially protein, maybe there would be a different understanding of need versus appreciation for eating meat. As we have seen in the results, the protein intake for very young children is much higher in infants and toddlers and reduces as they get older. Children in Sanambele are usually breastfed until 2 years of age, which provides them with an excellent form of protein. (Dunkel, 2009)
- Increasing the duration of breastfeeding since it will provide the child with a perfect amount of protein as well as an immune system from the mother. There are numerous advantages to breastfeeding and as a mother and strong proponent of breastfeeding this would always be a number one solution to giving the child the best.

- Raising a healthy flock of grasshopper would also be an alternative solution to not eating the wild types with exposure to contaminated cotton field. As long as these grasshoppers remain in a coop and do not get exposed to chemicals, they should be able to provide a healthy nutritious snack for children. That again raises the concern for food for these insects, though. Grasshoppers feed on crops, which have to be collected from the nearby area. Whether or not these crops are safe for consumption may take an evaluation of the health of crops that would be used for feeding orthoptera. A general evaluation of the health of crops in the village is recommended since villagers harvest them and use for their own consumption
- And last but not least, because Sanambeleans are an oral tradition, it would probably be helpful to create participatory diagrams about nutritional requirements for children, the links between healthy crops and yield and the risks of pesticides and how to avoid them. There are many solution to the problem and many of which have already been addressed.

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Appendix I

Essential Amino Acid	mg/g of Protein
Tryptophan	7
Threonine	27
Isoleucine	25
Leucine	55
Lysine	51
Methionine+Cystine	25
Phenylalanine+Tyrosine	47
Valine	32
Histidine	18

Table of ideal combination for complete protein

Appendix II

Search engine data table

Database/Index	Keywords/ Combination	Hits
Google Scholar	Kwashiorkor + grashopper	93
	Kwashiorkor + Mali	576
	Kwashiorkor + Sanambebe	0
	Kwashiorkor	20300
	malnutrition + grashoppers	1280
	malnutrition + breastfeeding	23200
	kwashiorkor + cotton production	723
	cotton production + Mali	18100
	cotton production + pesticide	48900
	cotton production + pesticide +Mali	3990
	cotton + grasshopper + kwashiorkor	38

Appendix III

Protein: These values reflect the 2002 Dietary Reference Intakes (DRIs) updates from the Food and Nutrition Board of the National Academy of Sciences. As a point of reference, 3 ounces of lean beef, which is a serving about the size of a deck of cards, provides 30 grams of protein. A cup of milk contains 8 grams of protein.

Age	Recommended Protein Intake (grams/kg body weight/day)
1 to 3	1.1
4 to 13	0.95
14 to 18	0.85

Source: [Dietary Reference Intakes: Macronutrients, Institutes of Medicine, 2002](#)

Appendix IV

How Food Label Reference Values (DV) Compare to the Nutritional Recommendations for Children						
Nutrient	DV	Nutrient Recommendations by Age (DRI)*				
		2-3 years	4-8 years	9-13 years	14 - 18 yr girls	14 - 18 yr boys
Protein (grams)	50	13	19	34	46	52
Iron (mg)	18	7	10	8	15	11
Calcium (mg)	1,000	500	800	1300	1300	1300
Vitamin A (IU)	5000	1000	1333	2000	2333	3000
Vitamin C (mg)	60	15	25	45	65	75
Fiber (g)	23	14 - 19	19 - 23	23- 28 (girls) 25- 31(boys)	23	31-34
Sodium (mg)	2400	1000- 1500	1200- 1900	1500-2200	1500-2300	1500-2300
Cholesterol (mg)	300	<300 for over age 2	<300	<300	<300	<300
Total Fat (g)**	65	33 - 54 (30 -35% of calories)	39 - 62 (25 - 35% of calories)	62 - 85 (25 - 35% calories)	55 - 78 (25 - 35% calories)	61 - 95 (25 - 35% of calories)
Saturated Fat (g)**	20	16-Dec (> age 2) (<10% calories)	16 to 18 (<10% calories)	girls: 18-22 boys: 20-24 (<10% calories)	22 (<10% calories)	24 - 27 (<10% calories)
Calories***	2000	1000 - 1400 (2-3 years)	1400-1600	girls: 1600-2000 boys: 1800-2200	2000	2200- 2400
Source: 1999 - 2002 Dietary Reference Intakes, Institutes of Medicine and 2005 Dietary Guidelines ©Children's Nutrition Research Center at Baylor College of Medicine Last modified: March 4, 2005						

Appendix V

Stage	Sex	N	Wet weight (g)	Dry weight (g)	Percent water	No. required
4th instar	Male	5	0.098 ± 0.011	0.024 ± 0.005	75.4%	2,650
	Female	5	0.236 ± 0.114	0.064 ± 0.034	73.3%	994
5th instar	Male	9	0.203 ± 0.035	0.053 ± 0.014	73.7%	1,200
	Female	6	0.480 ± 0.091	0.142 ± 0.051	70.9%	448
Adult	Male	10	0.364 ± 0.037	0.116 ± 0.018	68.2%	548
	Female	10	0.988 ± 0.239	0.313 ± 0.072	68.3%	203