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Survival and changes in the fine structure of selected tissues of *Penaeus monodon* Fabricius juveniles fed various carbohydrates

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Juveniles of *Penaeus monodon* Fabricius (initial mean weight of 1.76 g) were reared on semi-purified diets containing 10 or 40% maltose, sucrose, dextrin, molasses, cassava starch, corn starch or sago palm starch for six weeks.

Significant differences were observed between the type as well as the level of carbohydrate in the diet on the survival of juvenile prawns (Table 1). Among the starches, sago palm starch provided for best survival at the 10% and cornstarch at the 40% level.

Within ten days of rearing, complete mortality was observed on prawns fed with higher level of maltose and molasses (Fig. 1). To confirm these results and prove that the dietary treatment rather than bacteria was the cause of death, terramycin and non-terramycin treated prawns were fed 10% or 40% of either maltose or molasses. Seven out of ten prawns died within a 10-day period in those fed 40% maltose or molasses. The level of carbohydrates in the diet was responsible for early death ($x^2 = 14.02$). There was no relationship between time to death and size of the prawn ($r = -0.10$).

Growth of prawns was generally poor on any of the dietary treatments (Table 1). A greater number of animals did not molt among those fed 40% than among those fed the 10% carbohydrates (Table 2). Of those that survived, about the same number were able to molt once in both 10% to 40% levels. Beyond the first molt, prawns fed 10% carbohydrates molted many more times than the animals fed the 40% carbohydrates.

Results indicate that there does not seem to be any correlation between survival and the complexity of carbohydrates. The carbohydrates in this study can be grouped into simple-maltose and sucrose; intermediate-dextrin and molasses, and complex-sago palm starch, cassava starch and cornstarch. Maltose and molasses are classified as simple and intermediate, respectively, but survival rates were the same for both. While sucrose and maltose are both disaccharides, survival

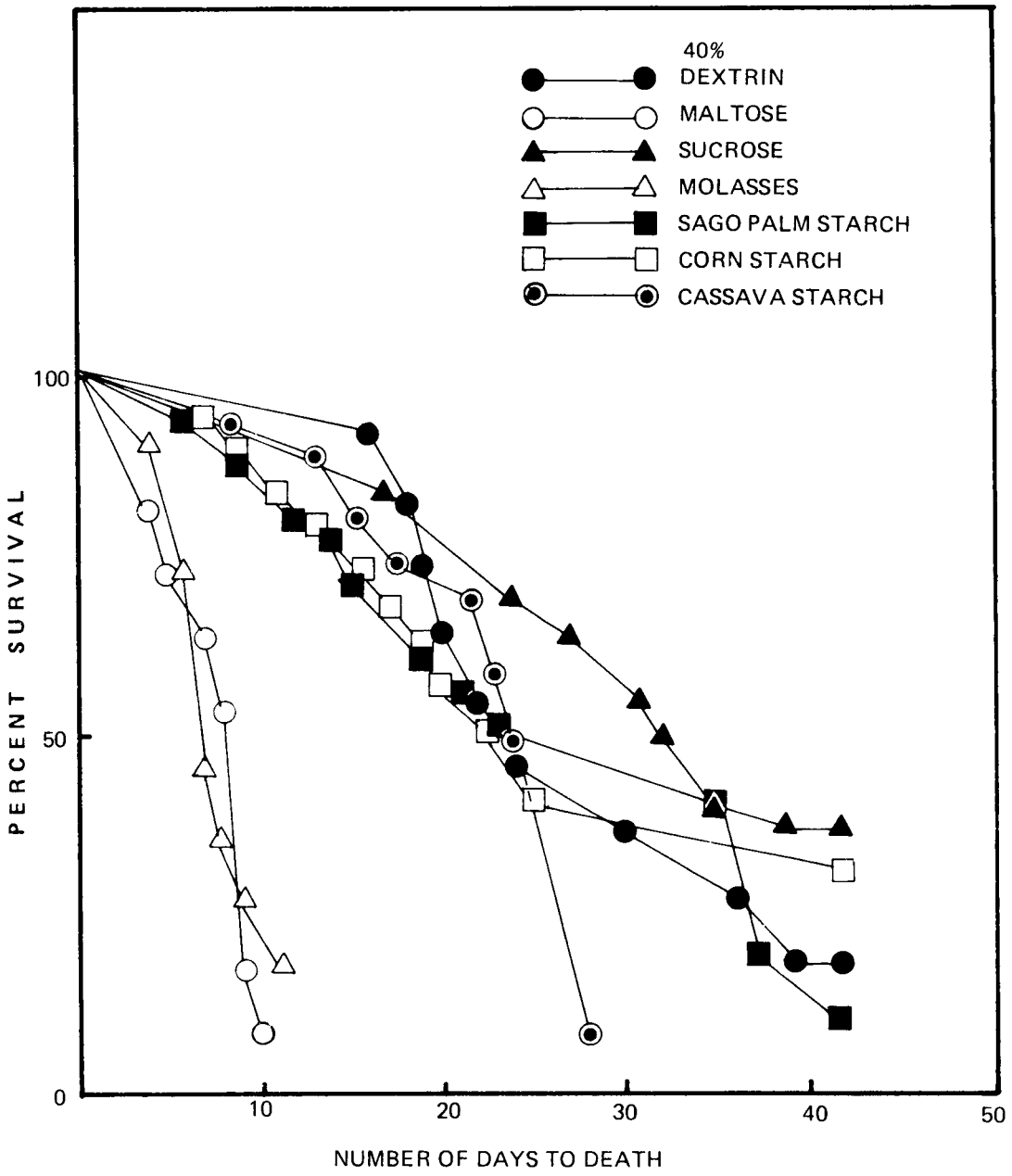

Fig. 1. Survival vs. time to death curve of *P. monodon* juveniles fed various sugars at 40% level in the diet.

was significantly higher in prawns given the sucrose diets (10% and 40%) than those fed the maltose diet. However, the end products of digestion of each of these two sugars show that sucrose splits into glucose and fructose while maltose splits into two units of glucose (White *et al.*, 1973). Maltose differs in property from sucrose in that it is a reducing sugar while sucrose is not.

Table 1. Mean survival rate and weight gain of juvenile *P. monodon* fed various carbohydrates containing diets after six weeks of rearing

Carbohydrates		% Survival			Average % Gain	
Level		10%		40%	10%	40%
Dextrin	(23)	36	(23)	23	24	34
Maltose	(23)	35	(23)	0	5	–
Sucrose	(23)	56	(22)	38	7	28
Molasses	(22)	0	(21)	0	–	–
Sago palm starch	(22)	42	(22)	0	7	–
Cornstarch	(23)	27	(22)	32	14	26
Cassava starch	(23)	0	(21)	0	–	–

Number in parenthesis represent initial stock.

Trehalose, the sugar found in insect hemolymph has similar properties to that of sucrose in that both are non-reducing sugars. However, trehalose splits into two glucose units similar to maltose in the presence of an enzyme trehalase found in insects and crustacea.

According to Deshimaru and Yone (1979) sucrose is a suitable source of dietary carbohydrate while starch, dextrin and particularly glucose are less desirable for *P. japonicus.* In this study sucrose was the "best" sugar in both 10% and 40% levels.

Growth rates were lower at the 10% levels and higher at the 40% level. Andrews *et al.*, (1972) observed a decrease in growth rate in *P. setiferus* when glucose was added to the diet while 30% starch produced higher growth rates compared to those fed diets without starch.

Table 2. No. of molts of prawns fed 10% and 40% levels of various carbohydrates

Carbohydrates	No. of Molts											
	0		1		2		3		4		5	
Level	10%	40%	10%	40%	10%	40%	10%	40%	10%	40%	10%	40%
Maltose	4	16	9	7	6	–	3	–	1	–	–	–
Molasses	5	14	7	6	7	1	3	–	–	–	–	–
Dextrin	3	9	10	10	5	3	3	–	2	–	–	–
Cornstarch	6	7	7	9	4	5	4	–	1	–	–	–
Sucrose	2	6	11	6	4	5	4	5	2	–	–	–
Sago palm starch	5	4	8	14	8	2	–	2	–	–	1	–
Cassava starch	6	4	9	8	4	7	2	1	2	1	–	–
TOTAL	31	60	61	60	38	23	20	8	8	1	1	–

The histopathology of the experimental prawns indicate degenerative changes in the digestive gland whether at the low or high level of carbohydrates.

Literature cited:

Andrews, James W., Lovell V. Sick and Garry J. Baptist, 1972. The influence of dietary protein and energy levels on growth and survival of penaeid shrimp. Aquaculture 1:341-347.

Deshimaru, Osamu and Yasuo Yone, 1978. Effect of dietary carbohydrate source on the growth and feed efficiency of prawn. Bull. Jap. Soc. Sci. Fish. 44(10):1161-1163.

White, Abraham W., Philipp Handler and Emil H. Smith, 1973. Principles of Biochemistry. 5th edition. McGraw-Hill Book Company, New York.