Asian Fisheries Science 2(1988): 115-119.
Asian Fisheries Society, Manila, Philippines
https://doi.org/10.33997/j.afs.1988.2.1.011

Development of Induced Spawning Procedures for Grass Carp, *Ctenopharyngodon idella*, in Syria

M.G. HUSSAIN*

United Nations Development Programme
Damascus, Syria

Abstract - Standardized hypophysis injection techniques for grass carp in subtropical conditions (23-25°C) were derived which were more effective to induce ovulation and spawning than any established methods of hypophysation. The existing relationship between pituitary dosage and body weight in female grass carp was also modified in an attempt to bring more accuracy in estimating the dose for successful ovulation.

Four standard designs of hypophysis injection of preparatory (23-35%) and decisive (65-77%) doses were successful. In three of them, 100% success was achieved in nine injected females; in the fourth, two of three female grass carp spawned. Spawning was accomplished in a cement tank under controlled conditions 9-12 hours after the decisive injection.

Kuronuma (1968) and Vinogradov (1968) reported that the success of induced spawning of grass carp by pituitary hormone injection was achieved for the first time in China (1960) and the USSR (1961), respectively. In 1964, the technique of wet fertilization or spawning of injected fish in ponds/tanks was successfully developed in China (FAO 1983). The method was then adopted in many other countries and the hypophysis injection procedures have been standardized locally by many fisheries workers. Successful spawnings of grass carp by injections of pituitary homogenate were also reported in other regions (Lin 1965; Chaudhury et al. 1966; Chen et al. 1969; Anon. 1970; Boyd and Baily 1972; Shrestha 1973; Prabhavathy and Sreenivasan 1977; Bohl 1979; Stanley 1979; Shireman and Smith 1983).

*Present address: Principal Scientific Officer, Fisheries Research Institute, Mymensingh, Bangladesh.

In Syria, successful artificial propagation of grass carp was carried out for the first time by Jehan and Egg (1977). Lately, induced spawning of the fish has been successfully achieved by Hussain (1981, 1985) and others.

The main objective of the present study was to standardize the hypophysation technique for artificial propagation of grass carp in Syria.

The induced breeding experiments described were conducted at the Qalaat el Moudik Fish Hatchery, Syria, from 12 June to 2 July 1985.

Healthy, sexually mature broodstock of grass carp (40 females and 50 males) were collected from two Syrian fish farming stations a few months before the experiments were conducted. The stocks were held in a 0.3-ha holding pond and fed once daily with adequate amount of soft cut-grass at the rate of 20-26% body weight at 21-26°C in order to accelerate the full maturation of gonads.

During mid-March 1985, fresh pituitaries were collected locally from 600 mature mirror carp (weighing 1.3 to 1.8 kg each) just prior to their spawning season to obtain gonadotropin at its highest level. The average weight of the pituitaries (acetone dried) was about 2.0 mg. The Pituitary Bank of FAO's Fisheries Department in Rome, Italy, also provided 50 dry carp pituitaries (2.6 mg each) in December 1984.

Ovarian maturation was assessed by the following external characters: 1) soft, distended and bulging abdomen; 2) swollen and pinkish vent.

Ripeness of males was assessed by: 1) the presence of deciduous tubercles (pearl organ) on the dorsal and medial surface of the pectoral fins; 2) oozing of the milt when the abdomen was pressed gently near the vent.

The total dosage of pituitary glands (acetone dried) was calculated on the basis of body weight of the spawners. The dosage used for female fish weighing 6-8 kg was 4-6 mg pituitary per kg body weight of the recipient. The dosage used for the male was 2 mg pituitary per kg body weight (4-6 kg each). The hypophysis injection for the females was applied in two fractional doses, the first or preparatory injection was 23-35% of the total dose and the second or decisive injection was the remaining 65-77%. Two injections were given at an interval of 7-10 hours. After the first injection each female breeder was transferred at once to a concrete spawning tank (10 x 3.5 x 1 m) together with two uninjected males. The males were not given

a preparatory injection, only the decisive one, in case they released the milt before the females were ready to spawn. The decisive injection (100% pituitary dosage) was administered into the body of males at the time of the second or decisive injection of the females.

Twelve experiments were carried out, each using three female grass carp. Four injection regimes and two time periods between injections were tested.

Table 1 shows the injection procedures and reaction of grass carp females to gonadotropin. Successful induction of ovulation and spawning was achieved in 11 experiments. The relationship between pituitary dosage and body weight in female grass carp is illustrated in Fig. 1. In order to standardize the hypophysation technique, exact determination of pituitary dosage must be specified, although the efficiency of any dose is also related to the sexual maturity of both donor and recipient and their phylogenetic relationship, the gonadotropin potency of the injected preparation, and the physiological state of the recipient (Nash and Shehadeh 1980). The method of administration of pituitary homogenate by fractional doses is critical in accelerating the successive stages of development of eggs. The proportion of total dose (from Fig. 1) given in the preparatory dose was varied between 23% and 35%. At the two highest levels of preparatory dose, 33% and 35%, the period before the decisive injection was reduced from 10 to 7 hours. All procedures were

Table 1. Injection procedures and reaction of grass carp females to gonadotropin(s) in induced breeding experiments in Syria, 1985.

Experiment no.	Body weight (kg)	Preparatory dose			Decisive dose			Time of spawning (hr-min)	Result ovulation and spawning success
		Dose/ kg fish (mg)	Fractional dose (%)	Time (hr)	Dose/ kg fish (mg)	Fractional dose (%)	Time (hr)		
1	6.0	0.92	23	1000	3.08	77	2000	6-15	+
2	6.0	1.33	23	0945	4.47	77	1945	5-15	+
3	8.0	1.38	23	1015	4.62	77	2015	5-15	+
4	7.0	1.25	25	0900	3.75	75	1900	4-45	+
5	8.0	1.50	25	0850	4.30	75	1850	4-45	+
6	8.0	1.50	25	0855	4.50	75	1855	4-40	+
7	7.0	1.98	33	1115	4.02	67	1815	3-15	+
8	7.0	1.65	33	1100	3.35	67	1800	3-20	+
9	6.0	1.32	33	1130	2.68	67	1830	3-30	+
10	6.0	1.40	35	1105	2.60	65	1805	6-15	+
11	7.0	1.75	35	1055	3.25	65	1755	6-15	+
12	7.0	1.40	35	1100	2.60	65	1800	—	—*

*Probably recipient female was not mature enough for the procedures.

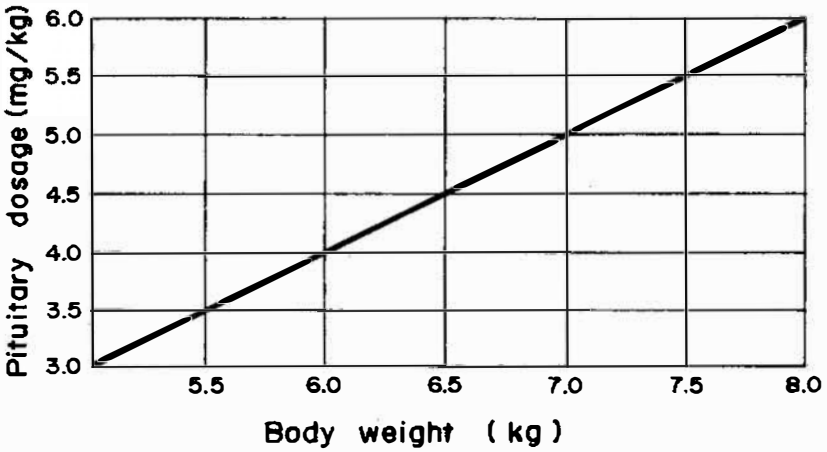

Fig. 1. Relationship between pituitary dosage and body weight in female grass carp (modified after Woynarovich and Horvath 1980).

successful, except one of the three fish receiving 35% preparatory dose and the decisive injection after 7 hours. These hypophysis injection procedures have proven to be more suitable and effective to induce ovulation and spawning of grass carp than any established methods of hypophysation in this subtropical condition. Woynarovich and Horvath (1980) suggested a general successful sequence of preparatory (10%) and decisive (90%) dose method of pituitary hormone administration at an interval of 18-24 hours in common carp and Chinese carp in temperate and subtropical regions.

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Manuscript received 4 February 1988; accepted 12 July 1988