DEVELOPMENTS IN FISH CULTURE

Comparison of eye-up of rainbow trout eggs spawned by injecting oxygen at four, eight, twelve and sixteen pounds of pressure versus spawning with hand pressure.

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INTRODUCTION

The presence of broken eggs in pans of cold water fish eggs can greatly reduce fertilization success. Carl (1941) reduced fertilization success 100% when 80 broken eggs were added to pans of 600 coho salmon (Onchorynchus Kisutch) eggs prior to fertilization in water. Billard (1977) and Piper, etal. (1982) suggested that yolk proteins from broken eggs cause agglutination of spermatozoa, reducing sperm motility and hindering fertilization. Leitritz and Levis (1976) stated that yolk proteins from broken eggs may block the micropyle preventing the sperm from penetrating the egg.

Fish eggs are delicate and can easily be broken by rough handling of fish prior to spawning and by poor spawning techniques. Use of excessive hand pressure when stripping eggs from fish by hand can break eggs both inside the fish prior to release and outside the fish by striking the spawning pan with too much force. Use of excessive air pressure during air spawning may also break eggs by expelling them with too much force.

At the Ennis National Fish Hatchery most fish are spawned by injecting oxygen into the body cavity at different pressures. Rainbow trout females weighing 2 to 4 pounds each are injected with oxygen at 3 to 5 pounds per square inch (PSI). Females weighing 4 to 8 pounds each are injected with oxygen at 5 to 8 PSI. There has been concern that some eggs may be broken at these pressures.

OBJECTIVE

The objective of this experiment was to determine the maximum air pressure that could be used without reducing fertilization success.

MATERIALS AND METHODS

Three experiments were performed during August 1998 using two-year old Erwin females averaging 3.5 pounds each in weight. Three groups of ten females were spawned using air pressures of 4, 8 and 12 PSI. Approximately one-half of the eggs from each female in each group were stripped by hand using normal hand pressure. The remaining eggs were expelled from females with air pressure. The hand stripped portion of eggs served as the control for each air pressure tested. All eggs were expelled into pans containing one liter each of 0.75% saline solution. Each pan of eggs was fertilized with 10 ml of precollected and pooled milt from 20 ERD-96 males. Milt was mixed with each pan of eggs by pouring back and forth into another pan three times. Each pan of eggs was rinsed within two minutes of fertilization and then water hardened for 30 minutes in a 50 parts per million (PPM) iodine solution. After water hardening, each pan of eggs was split into 3 replicates of test jars for incubation.

The eggs were shocked on day 15 and picked on day 16. The blanks were sample counted in 3-100 egg samples from each replicate of good eggs after being electronically picked. Both good and bad eggs were then counted with an electronic egg counter to determine fertilization success.

A “Two-Sample T Test” (Statistix 4.1) was used to compare the mean percent eyed in each group.

RESULTS

The three tests cannot be compared with each other because different females were used for each test. Average percent eyed at each air pressure was compared with the hand spawned portion of that group. Comparison of means by a “Two Sample T Test” indicated no significant difference in eye up at the 0.05 level between the hand and air spawned groups at 4 PSI air pressure (Table 1). There was a significant difference in eye-up at the 0.05 level between the hand and air spawned groups at both 8 PSI and 12 PSI (Table 1). There was concern that 8 PSI of air pressure could not be built up in the fish after half of the eggs had been stripped by hand, so a finger was held over the vent to build up more pressure. The result was that the eggs may have been expelled from these fish with more than 8 PSI. Average eye-up of eggs from fish spawned with 12 PSI air pressure was 6.37% less than those spawned by hand (Table 1).

This test was repeated during January 1999 using three-year old McConoughy females averaging 4.0 pounds each in weight. Three groups of ten females were spawned using air pressures of 8, 12 and 16 PSI. Approximately one-half of the eggs from each female in each group were stripped by hand using normal hand pressure. The remaining eggs were expelled from each female with air pressure. The hand stripped portion of eggs served as the control for each air pressure tested.

Comparison of the mean percent of eyed eggs in each group by a “Two-Sample T Test” indicated significantly lower eye-up ($P<.05$) of eggs spawned using 8,12 and 16 PSI air pressure versus normal hand pressure (Table 2).

CONCLUSION

Results of these tests indicated that eye-up was reduced when eggs were expelled with air pressures of 8, 12 and 16 PSI when compared to eggs expelled with normal hand pressure. However most of this reduction in eye-up may have been caused by stage of expulsion rather than excess pressure. In a previous experiment when six Arlee females were spawned, there was a 3.5% reduction in eye-up between the first a of eggs expelled and the second a ; and there was another 3.5% reduction in eye-up between the second a of eggs expelled and the last a. This test should be repeated expelling the first ½ of the eggs with air pressure and last ½ with hand pressure. Whether spawning by hand or air, excess pressure should be avoided. When spawning with air, hand pressure should not be applied until the needle is removed from the fish.

TABLE 1. Comparison of eye-up of Erwin strain rainbow trout eggs spawned by injecting oxygen at four, eight, and twelve pounds of pressure versus spawning with hand pressure.

Pressure/Trtm.	Total Eggs	Net Eyed	% Eyed
4/Hand	5717	5450	95.33
4/Hand	5464	5036	92.17
4/Hand	4296	4110	95.67
		Average	94.31[a]
4/Air	5635	5274	93.59
4/Air	6042	5575	92.27
4/Air	7588	6964	91.78
		Average	92.46[a]
8/Hand	4936	4313	87.38
8/Hand	6180	5330	86.25
8/Hand	5302	4644	87.59
		Average	87.02[b]
8/Air	6539	5086	77.78
8/Air	8742	6827	78.09
8/Air	8579	6714	78.26
		Average	78.07[c]
12/Hand	5469	5238	95.78
12/Hand	7042	6821	96.86
12/Hand	6972	6670	95.67
		Average	96.13[d]
12/Air	8494	7520	88.53
12/Air	9280	8455	91.11
12/Air	6872	6148	89.46
		Average	89.76[e]

Common superscripts denote no significant statistical difference $P<.05$.

TABLE 2. Comparison of eye-up of McConoughy strain rainbow trout eggs spawned by injecting oxygen at 8, 12 and 16 pounds of pressure versus normal hand pressure.

Pressure/Trtm.	Total Eggs	Net Eyed	% Eyed
8/Hand	5101	4297	84.23
8/Hand	4921	4084	82.99
8/Hand	5150	4234	82.21
		Average	83.14[a]
8/Air	5854	4362	74.51
8/Air	5734	4137	72.14
8/Air	5979	4215	70.49
		Average	72.38[b]
12/Hand	7046	5525	78.41
12/Hand	7209	5578	77.37
12/Hand	7384	5743	77.77
		Average	77.85[c]
12/Air	6480	4730	72.99
12/Air	6133	4551	74.20
12/Air	6319	4713	74.58
		Average	73.92
16/Hand	6185	4898	79.19[d]
16/Hand	4104	3140	76.51
16/Hand	3930	2853	72.59
		Average	76.10[e]
16/Air	5594	3629	64.87
16/Air	6079	4225	69.50
16/Air	5997	4080	68.03
		Average	67.47[f]

Common superscripts denote no significant difference P<.05.

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