Abbassa International Journal for Aquaculture

Volume (4) Number (1), 2011

ISSN 1687-7638

Egyptian Society for Water, Aquaculture and Environment

Abbassa, Abou Hammad, Sharkia, EGYPT

ISSN 1687-7638

ABBASSA INTERNATIONAL JOURNAL FOR AQUACULTURE

Published by

Egyptian society for water, aquaculture and environment,
Central Laboratory for Aquaculture Research (CLAR),
Agricultural Research Center (ARC), Giza, Egypt

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GENERAL INFORMATION

Abbassa International Journal for Aquaculture is Egyptian specific publication in aquaculture of the Egyptian society for water, aquaculture and environment. The journal is published in four volumes per year to include results of research in different aspects of aquaculture sciences. The journal publishes also special issues of advanced topics that reflect applied experiences of importance in aquaculture sector.

Abbassa Int. J. Aqua., V0l.4 No.(1) 2011 *281 - 293*

EFFECT OF *SACCHAROMYCES CEREVISIAE* SUPPLEMENTATION IN THE DIETS AS PROBIOTIC ON THE REPRODUCTIVE PERFORMANCE OF COMMON CARP (*CYPRINUS CARPIO*)

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Received 20/ 6/ 2011 *Accepted 31/ 7/ 2011*

Abstract

This study was investigated the effect of supplemental of Saccharomyces cerevisiae, in diet, on the reproduction performance of Common carp (Cyprinus carpio). Broodstock were fed either a non-suppemented diet (control diet, CD) or a yeast supplemented diet (supplemented diet, SD) for 70 days before spawning (artificial spawning). The results revealed that the mass of eggs and Egg Wight Index Percentage (EWIP) were higher ($p<0.05$ and 0.01) in group yeast supplemented diet compared with the control group. The mean fertilization and the percentage of live embryos after 48 hrs were not significantly in all the treatments. The return and economic efficiency were higher (0.01) in group 3 (500g/ton) compared with the other groups.

Key words: Saccaromyces cervisiae, Common Carp (Cyprinus carpio), Reproductive Performance, nutrition.

INTRODUCTION

Incorporation of natural products, such as direct feed microbial (DFM) into fish feed is an important constraint to maintain efficient reproductive performance and improve production efficiency in aquaculture industry. So any factor that can improve the production in carp culture is of economical significance.

It has been shown that the use of probiotics can decrease the amount of food necessary for fish growth, which could result in reduction of the production rate (Lara-Flores *et al.*, 2003).

Yeasts are a rich source of protein and B-complex vitamins. They have been used successfully as a complementary protein source in fish diet (Liao, 1977).

Ibrahim and Abou-Seif, 2008, confirmed the possibility of replacing the expensive protein source (fish meal) with less expensive source (*Saccharomyces cerevisiae*) in tilapia fingerlings diets, whereas tilapia grew better when fed on diets contained yeast plus fish meal at a rate of 50/50 and 75/25 yeast/fish meal % than diets contained yeast or fish meal alone as a source of animal protein.

As promoting stimulating agents carp pituitary extract (CPE), human chorionic gondotropin (HCG) (Akar *et al.,* 2010b), ovaprim Hormon (Akar *et al.,* 2010a) were investigated. Regarding Yeast no reference was found concerning using it as addition for promoting the reproductive efficiency but it was used for growth promoter (Tewary and Patra, 2011)

The present study aims to evaluate the effect of *Saccharomyces cerevisiae* supplementation on reproductive performance of Common Carp (*Cyprinus carpio*).

MATERIALS AND METHODS

Fish:

A spawning experiment was conducted during April 2010 on 36 adult fish females of 2-3 years old common carp females, *C. carpio,* at Fish hatchery belongs to the Central Laboratory of Aquaculture Research (CLAR), Abbassa, Abou-Hammad, Sharkia Governorate, Egypt. Fish weighing 2.7–3.3 kg body weight were selected from earthen ponds for ripeness. After acclimatization for 24 h, fish were put in 12 concrete

ponds, each with 2.5 m in width, 5 m in length and 1.3 m in depth. The first control group (CD) feed on artificial diet with 25% protein without any additional yeast, second group (treatment 1) with supplemental diet 250 g/ton, third group (treatment 2) with supplemental diet 500 g/ ton and fourth group (treatment 3) with supplemental diet 750 g/ton. All groups were feed 70 days and fish weighted at beginning and at the end of experiment. All groups of fish were injected carp pituitary extract (CPE) by the same dose. Prior to the feeding experiment, all fish underwentry a 10 days conditioning period and were fed the basal diet without yeast supplementation in order to reduce body stores of yeast and to adapt fish to both the test diets and environmental conditions. Test diets were formulated in considering the nutritional requirements of common carp. The water quality was measured (Dewis and Fries, 1970) twice daily (Table1).

Tested yeast:

Tested yeast obtained from the Egyptian Company for Starch and yeast products are commercial products of the yeast (Fig-1) (*Saccharomyces cerevisiae*) grown on molasses. Yeast was dried at lower temperature (37 ºC). After that, cooled and saved in plastic bags and stored in refrigerator at 5 ºc until add to the experimental diets to avoid the nutrients deterioration. The dried yeast is approximately composed of 42.03% protein, 6.52%fat, 6.15%ash, 39.78% carbohydrate and 8.52% moisture, according AOAC (1990).

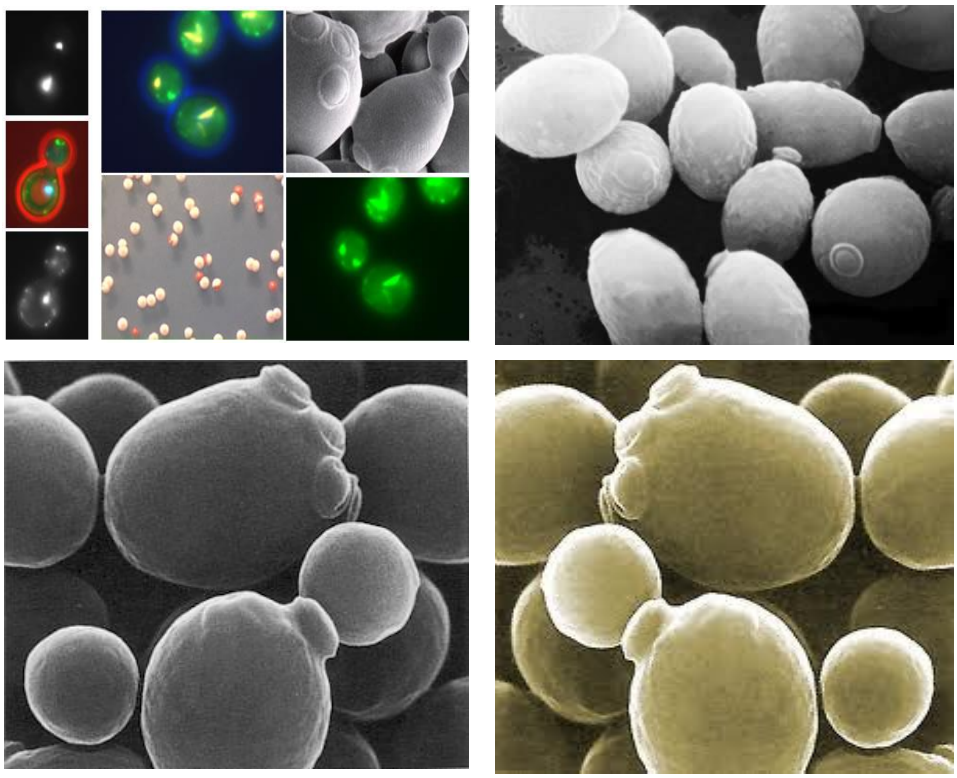

Figure 1. Show: Yeast (*Saccharomyces cerevisiae*)

After natural fertilization, eggs were collected in buckets and incubated in glass jars at which supplied with containous water at temperature of 22ºC.

Ovulation ratio and EWIP were estimated according to Szabo *et al.* (2002)

Ovulation ratio = number of ovulated females /number injected.

Egg weight index percentage (EWIP) = (weight of stripped egg mass/BW before stripping) *100

After 24 hours of incubation, percentage of fertilization and hatching was estimated according to Gheyas *et al.* (2001) as follows:

Fertilization rate = (Number of fertilized eggs / Total number of eggs) x 100

Hatching rate = (Number of hatched eggs (larvae) /Total number of eggs) x100

Statistical analysis all statistics were carried out using statistical analysis systems (SAS, 2004)

Injection cost = injection cost / kg x weight of fish. Fry production = weight of eggs x percentage of fertilization x 700.000 / 1000x 100.

Return = fry production price – injection cost. Economic efficiency = many return / injection cost x 100.

Blood samples were collected from the coudal vein of each tested, control and brood stock fishes, the whole blood samples after complied collecting were centrifugated at 3000 rpm for 10 min. at the serum samples were stored at -80 ^{o}C .

RESULTS AND DISCUSSION

After the hypophysation treatment, all females responded to injection with CPE after 8-9 hours (Latency period) in the group 1, 2, 3 and 4 respectively. No significant differences were obtained of Wet. female before injection between control group 1 (3290± 887.7) and group2, 3 and 4 (3520± 907.3, 2740± 364.6 and 4040± 616.8respevtively) (Table 1). Similar result were obtained at Wet. Female after injection.

Regarding the weight of obtained eggs in grams. The results of (Table 1& Fig1 and Fig2) showed that the mass of eggs and EWIP was significantly higher in group 3 than group 1 and in group 1 than group 2 and in group 4, respectively. These results were in agreement with Brzuska and Bialowas, (2002) and Brzuska, (2004). Akar (2006) and Akar and Ali (2006).

Czeczuga et al., 2003 studied the effect of the quality and quantity of food of bacterial, fungal and alga type on the body length of females, eggs size and duration of postembryonic growth of certain zooplankton species, Cladocera representatives. This study has revealed that the body length of females and the number of eggs increase, and the post-embryonic period is shortened when the food concentration increases. The more eggs are laid, the smaller size they are.

Regarding fertilization rate after 48 h, results of (Table 1 & Fig3 and Fig4) showed that the fertilization rate and the sac larvae after 48 hrs were in all groups were difference unsignificantly between control group1 78± 2.7 and group 2, group 3 and group 4. (78 ± 4.4, 78 ± 4.5 and 81 ± 4.1) respectively. Similar results were obtained at Hatching rate %.

Table 1. Statistical characteristics of the investigation traits**:**

Investigation traits	control	250gm/tone	500gm/tone	750gm/tone
Wet. Female before injection	3290± 887.7[a]	3520± 907.3[a]	2740± 364.6[a]	4040± 616.8[a]
Wet. Female after injection	2978± 892.0 [a]	3260± 847.0 [a]	2296± 291.6 [a]	3730.0 ± 569.6 [a]
Latency period(hrs)	8 -9 [a]	9[a]	8 – 9 [a]	9[a]
Mass of eggs	312± 64.9 [b]	260± 65.1 [c]	444± 81.7 a *	310± 54.7 [b]
EWIP	9.9± 3.0[b]	7.4 ± 6.1[c]	16.04± 1.4 a **	7.6± 7.0 [c]
Fertilization rate (%)	78± 2.7 [a]	78.0± 4.4 [a]	78± 4.5 [a]	81± 4.1 [a]
Hatching rate(%)	72± 2.7 [a]	73 ± 4.4 [a]	73± 4.5 [a]	76± 4.1 [a]

[a-c] Means within a row with the different superscript are significantly different (P<0.05).
Values are expressed as Mean ± SD.

Table 2: Effect of Yeast supplementation on the diet of Biochemical parameters of common carp (*C. carpio*).

Parameters	Control	250 gm/tone	500gm/ tone	750 gm/ tone
Cortisol	18.8 ±2.3[b]	18.7±2.1[b]	14.7± 1.0[a]	26.8± 3.1[c]
Blood glucose	130 ± 4.4[b]	100±3.5[c]	102.5± 2.9[c]	169.6±3.2[a]
Hemoglobin	7.1± 4.1[a]	6.3± 1.8[a]	8.1±1.1[a]	7.4± ±0.3 [a]
A. S .T	11.6±1.2[a]	12.3±3.4[a]	9.0 ±1.1 [b]	13.0±2.3[a]
A. L. T	10.0±3.2[b]	12.6±3.1[a]	8.3±1.2[b]	8.3± 3.1[b]
P.C.V	23.8±4.5[b]	22.0± 1.0[b]	26.6±5.1[a]	24.8±2.3 [a]

[a-c] Means within a row with the different superscript are significantly different (P<0.05). Values are expressed as Mean ± SD.

Results in (Table 2), the results showed that at Hemoglobin No significant difference were obtained between control group and other treatments. These results agreement with (Tewary and Patra 2011). The Blood AST. showed the lower significantly at G3 than control, G2 and G4, while high significantly ALT at G2 than obtained at G4, and G3 and control G1.

The results of P.V.C. (Table 2) showed that no significant differences between control G1 (23.8 ± 4.5) and G2 (22.0± 1.0). Also no significant were obtained between G3 (26.6 ± 5.1) and G4 (24.8± 2.3). While high significantly between both G 3 (26.6 ± 5.1) and G4 (24.8± 2.3) than both control G1 (23.8 ± 4.5) and G 2 (22.0± 1.0).

The results of Blood glucose showed that high significantly comparative with other treatments similar results were obtained at Blood glucose. These results agreement with (Akar *et al* 2011)

Table 3: Mean Physico-chemical characteristics of earthen water ponds during climatic period of the experiment.

Items	Mean	Items	Mean
Temperature(c)	26-28 ^{o}C	**Nitrate (mg/l)**	0.01
PH	8.7	**Nitrite (mg/l)**	0.02
Oxygen (mg/l)	8.1	**Salinity (mg/l)**	0.3

Salinity was calculated by relation (1000 micromos =0.7g salinity according to Dewis and Freila, 1970.

Regarding return and economic efficiency. The results of (Table 4) showed that the return and economic efficiency were higher (P 0.01) in group 3 than all groups .

Table 4: Economic efficiency for yeast (*Saccharomyces cerevisiae*) suppleme-nted on diet of Common carp reproduction.

Investigation traits	Control	250gm/tone	500gm/tone	750gm/tone
Cost of injection	26.6 ± 5.6 ^{a}	25.6 ± 6.1^{a}	26.2 ± 1.8 ^{a}	28.8± 3.4 ^{a}
Return	825.16± 200.1 ^{b}	688.2± 273.0 ^{c}	1188.9± 226.2 a **	850.0 ± 275.1 b
Economic efficiency	3102.1± 239.5 ^{b}	3186.1 ± 132.7 ^{b}	5124.5 ± 581.2 ^{a} ***	2951.3± 108.7 ^{c}

$^{a-c}$ Means within a row with the different superscript are significantly different (P<0.05).
Values are expressed as Mean ± SD.

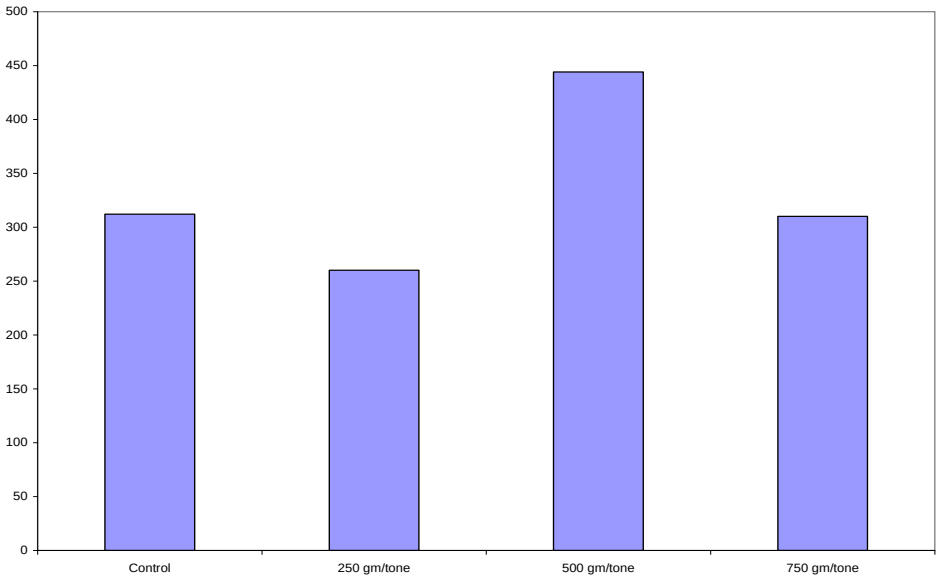

Fig (1): Effect of Yeast Supplementation on the diet of mass eggs of common carp *(C.carpio).*

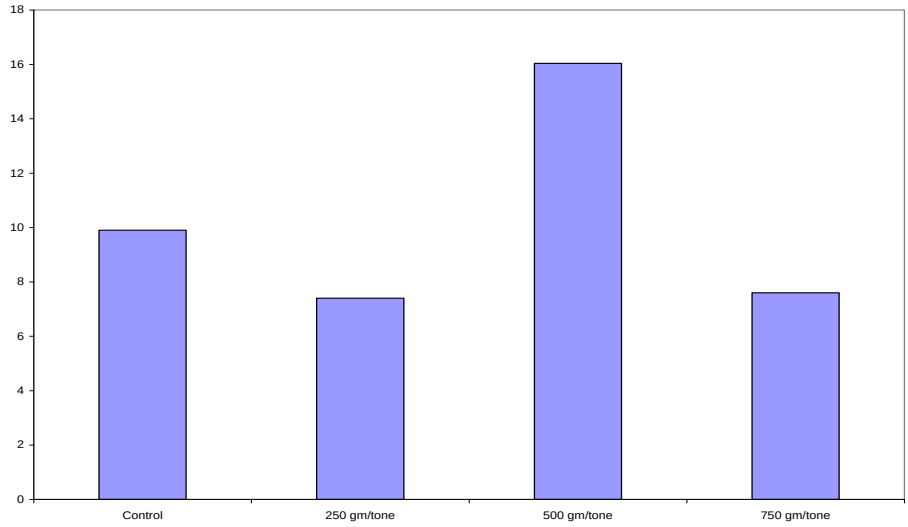

Fig (2): Effect of Yeast Supplementation on the diet of EWIP of common carp *(C. carpio).*

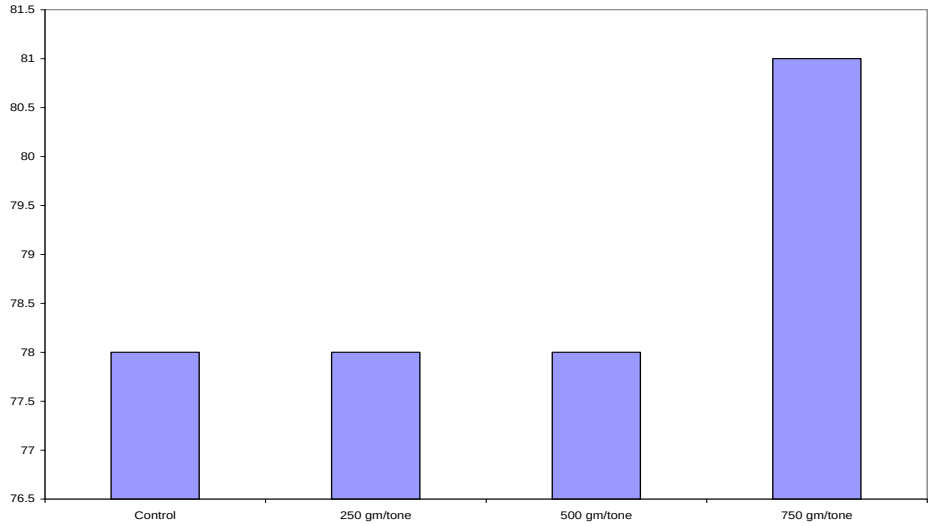

Fig (3): Effect of Yeast Supplementation on the diet of fertilization rate % of common carp *(C.carpio).*

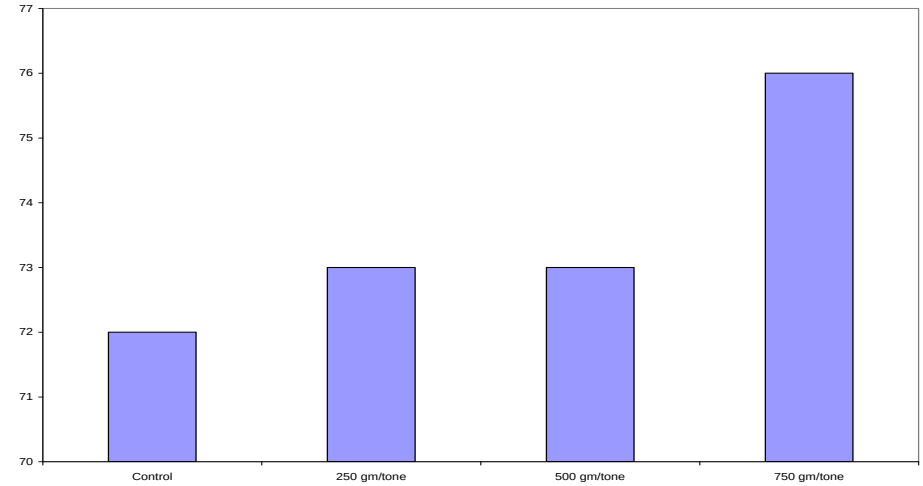

Fig (4): Effect of Yeast Supplementation on the diet of hatching rate % of common carp *(C.carpio).*

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تأثير إضافة الخميرة على أعلاف أمهات المبروك العادي كحافز للتكاثر

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الملخص العربي

استهدفت هذه الدراسة تأثير إضافة الخميرة على أعلاف أمهات المبروك العادي وتأثيره على التكاثر. حيث تم تغذية قطيع الأمهات بمعدلات ٢٥٠جرام للطن، ٥٠٠جم للطن، ٧٥٠جم للطن، بالإضافة إلى عليقة المقارنه وذلك لمدة ٧٠ يوم قبل موسم التفريخ (التفريخ الصناعي).

أوضحت النتائج زيادة معنوية لكمية البيض من أمهات المبروك العادي التى تم تغذيتها على اعلاف مضاف اليها الخميرة بمعدل ٥٠٠جم للطن بالمقارنة بباقي المجموعات بينما لم تكن هناك اختلافات معنوية في نسبة الإخصاب، كما أوضحت الدراسات الاقتصادية أن هذه المجموعة هي أفضل المعاملات مقارنة بباقي المجموعات.

ومن هذه الدراسة يوصى باستخدام الخميرة كمحفز للتكاثر بمعدل ٥٠٠جم للطن لأمهات أسماك المبروك العادي.