# EFFECTS OF CHINESE WATERCHESTNUT IN FLOATING RAFTS ON PRODUCTION OF CHANNEL CATFISH IN PLASTIC POOLS

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## ABSTRACT

Chinese waterchestnut was grown in rafts floating on catfish pools to determine effects on production of channel catfish fed daily. This plant may remove nutrients from the water and increase catfish production by improving water quality and, also, produce a second crop, the edible corm of the plant. Catfish were stocked in March, Chinese waterchestnuts were planted in April, and both were harvested in October. Survival and production of fish were 56% and 1230 kg/ha, 86% and 1871 kg/ha, and 87% and 1952 kg/ha in pools with fish only, fish and raft, and fish and raft with waterchestnut, respectively.

## INTRODUCTION

Intensive fish culture requires introducing large quantities of supplemental food into ponds. Waste food and metabolic wastes from fish enrich pond water and enhance growth of phytoplankton. A limited amount of phytoplankton is desired to shade the pond bottom sufficiently to prevent growth of rooted aquatic plants, but excess phytoplankton is detrimental to fish culture. A dense layer of phytoplankton forming near the surface prevents sunlight penetration to depths sufficient to maintain adequate rates of photosynthesis, thus dissolved oxygen in deeper water becomes depleted and is not replenished by photosynthesis. Several days of cloudy weather or sudden changes in temperature may result in death of most of the phytoplankton in a pond, and as these plants decompose they rapidly deplete remaining dissolved oxygen in the water. Consequently, the fish being cultured die from lack of oxygen.

Although numerous chemicals are available for thinning phytoplankton (Lawrence, 1958 and 1966; Moore and Kellerman, 1905; Sills, 1967), and various types of biological and mechanical means have been used to dispose of organic wastes (Greene[3], unpublished; Hasler and Jones, 1949; Jeffrey[4], unpublished; Kilgen[4], unpublished; Loyacono[4], unpublished), virtually nothing has been done to simultaneously remove and utilize excess nutrients from water in fish ponds. Vascular aquatic plants absorb nutrients and inhibit plankton growth (Hasler and Jones, 1949; Wahlquist, 1969 and 1972), but most interfere with fish harvesting and are of no economic value, thus they also present a disposal problem. A plant which will grow in water, remove excess nutrients from the water, not interfere with fish harvesting, and produce a useable product is needed.

A plant which may satisfy these criteria is *Eleocharis dulcis*, Chinese waterchestnut or matai. This member of the sedge family has been cultivated in China for hundreds of years (Hodge, 1956), and it has more recently been cultivated in North America (Hodge and Bisset, 1955). The roots of matai

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[3]Auburn University. Fisheries Annual Report 1969.
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produce a plump, firm corm which has a crisp apple-like texture and is used as an ingredient in many oriental dishes and also is eaten fresh out of hand (Hodge, 1956). Matai, like most other members of its family, grows naturally in wet areas, such as marshes or pond edges, and it is often rotated with rice in flooded fields (Groff, 1950).

The objective of this research was to investigate the possiblity of using Chinese waterchestnut to utilize excess nutrients and as an economical means of increasing fish production by improving pond water.

## MATERIALS AND METHODS

Catfish fingerlings were stocked on March 15, 1972, into 12 plastic pools, 3.08 m(10 ft) in diameter and 0.08 m (2.5 ft) deep, and fed a complete ration six days each week from March 20 through October 9, 1972. There were 15 cm (six inches) of soil in the bottom of each pool. Four of the pools served as controls, four had rafts floating in them and four had nine waterchestnut corms planted on April 15, 1972, in a raft floating near the surface of the water. Treatments will hereafter be referred to as control, raft, and waterchestnut, respectively. The rafts were wooden frames, 1.23 m (four ft) square and 10.2 cm (four inches) deep, with aluminum window screen and hardware cloth tacked across the bottom and filled with vermiculite.

Waterchestnut plants, including corms and the rest of the roots, were removed from the vermiculite, rafts were removed from the pools, water was drained from the pools, and surviving catfish were counted and weighed on October 26, 1972. Waterchestnut plants were allowed to air dry in shade for 48 hours, then weighed.

## RESULTS AND DISCUSSION

Catfish survival and production and food conversion rate are presented in Table 1. Although treatment means of survival rate and net production were higher and means of conversion rate were lower from control to raft to waterchestnut treatments, these apparent differences were not statistically significant when Duncan's Multiple Range Technique (Steel and Torrie, 1960) was applied to the data. If apparent differences between control and raft treatments were real, these may have been a result of fish having cover provided by rafts. Schmittou (1970) found that catfish in cages with opaque tops fed more efficiently than those with transparent tops. Trends indicated by treatment means may be real differences, but variability of data and small numbers of replications may have prevented statistical analyes from showing significant differences. Additional experiments with more replicates and conducted in earthen ponds will be necessary to better document effects of these treatments.

Chinese waterchestnut production was kg/(5.1 lb.)/pool or 3176 kg/ha (2836 lb./acre).


## SUMMARY

1. Three treatments were assinged in replicates of four to a total of 12 plastic pools, in which channel catfish were fed from March through October.
2. Treatments were: control-catfish only; raft - a wooden frame filled with vermiculite floating in the pool; waterchestnut - Chinese waterchestnut growing in the raft.
3. Although treatment means indicated higher fish survival and production and lower feed conversion rate in the raft than in the control treatments, differences were not statistically significant.

Table 1. Treatment Means of Channel Catfish survival and Production and Feed Conversion Rate in Pools in Chinese Watchestnut Experiment.

| | Treatment | | |
|---|---|---|---|
| | Control | Raft | Waterchestnut |
| PerCent Survival | 56 | 86 | 87 |
| Net Production (kg/ha) | 1230 | 1871 | 1952 |
| Feed Conversion Rate | 2.18 | 1.60 | 1.55 |

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