

Tilapia Duckweed Fed

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Foreword

Duckweed is a tiny aquatic plant covering stagnant water bodies; it's seen in channels and waterways in semi-tropical and tropical climates in most countries. The green, three rounds fronds plant, or any of its four genera is known to many people who have seen it without realizing such aquatic plant is Duckweed or that such an abundant microphyte plant, considered an invasive plant, offers a great potential as animal feed, specially for fish.

Its high level of protein content makes it an ideal fish feed for Tilapia, Carp and possibly other fish as well with great potential savings as fish feed. Duckweeds have structural features that have been simplified by natural selection. A duckweed leaf is flat and ovoid. Many species have adventitious roots which function as a stability organ and which tend to lengthen as mineral nutrients in water are exhausted.

Compared with most plants, duckweed leaves have little fiber (5% in dry matter of cultivated plants) as they do not need to support upright structures. Roots, however, appear to be more fibrous. As a result the plant has little or no indigestible material even for monogastric animals like fish. This contrasts with many crops such as soya beans, rice, or maize, where approximately 50% of the biomass is in the form of high fiber, and low digestibility residues.

Their unique properties, such as their phenomenal growth rate, it doubles its size every twenty-four (24) hours or so, offers great potential savings for the animal grower.

Its high protein content, its ability to clean wastewater and growth quickly even in brackish water, have been investigated and documented in the last ten years.

Nevertheless, the recognition of its full potential is still unknown to most animal growers and fish farmers, while its genetic experimentation doesn't exist or is unknown or unpublished at this point.

This manual intends to propagate the value of Duckweed as a food alternative to animal growth, focusing this intent on fish farming, where its potential impact will be recognized immediately by a savvy fish farmers for many reasons discussed here. In the last two decades Duckweed has been investigated for commercial applications seeking to treat wastewater by American firms; mainly by the PRISM Group which pioneered Duckweed farming in India and Peru.

Its use as fish feed and its commercial use in the treatment of wastewater investigation by the World Bank resulted as an alternative for third countries nutritional options. Both investigative programs in South Asia and Latin America, suggested that Duckweed cropping would be important as a source of fish and poultry feed; additionally the investigation demonstrated the use of Duckweed as a wastewater treatment alternative.

This Technical Study for Latin America and Asia was designed to put together relevant information on Duckweed farming, its beneficial uses and to make such information available to people worldwide. It's therefore, the intention of this manual to disseminate currently available technical and agronomic information on duckweed agronomy and use as animal feed.

The e-manual may be requested free from the Coop based on need and lack on buying power. The information in this technical manual comes from many sources; the contribution of the staff at the experimental station in Bangladesh and its directors. Auburn University provided technical support.

Preface

The purpose of this booklet is to present a group of tiny aquatic plants commonly known as "duckweeds"; an aquatic plant known to most fish farmers. Its technical information, however, is being gathered in this manual to make it easily accessible to those seeking optional feed fish approaches. As a promising new commercial aquaculture crop may cut fish feeding cost substantially.

Duckweed species are members of the taxonomic family Lemnaceae, including the four most commonly known genera. *Lemna minor*, *Spirodela*, *Wolffia*, and *Wolffiella*.

This paper summarizes current knowledge, gained from practical experience in an experimental program in Bangladesh, India, where duckweed cultivated as fresh feed for carp and tilapia proved successful beyond any doubt. In the experimental program a farming system yielded dry-weight of 20 - 35 metric tons per hectare per year (ton/ha/year).

A rate exceeding single-crop soybean production six to tenfold under monitored crop management.

As an aquatic plant Duckweed species have a high water content, however, it has about the same quantity and quality of protein as soybean meal. Fresh duckweed plants have the potential to be a complete nutritional package tilapia and other animals.

Additionally, Duckweed appears to be significantly more productive and easier to manage than traditional plants. Economics of duckweed farming and duckweed-fed fish production likely to affect it farming and future commercial use in forms not yet developed.

Its potential for commercial applications might lead to: (1) a dried form as the high protein component of animal feeds (2) as a commercial crop for the animal growing markets with cost saving nearing 60% of feed.

There is a good body of literature covering its feeding value from poultry to fish. The information presented here make investigative information available to fish farmers seeking alternative fish feed options, mainly for Tilapia the concern of the Coop.

Section 1 - Biology of Duckweed

Duckweed species are the smallest floating aquatic flowering plants found worldwide. Often seen growing in thick, blanket-like mats on still, nutrient-rich fresh and brackish waters in channels and waterways in semi-tropical and tropical climates.

Belonging to the botanical family Lemnaceae and are classified as higher plants, or macrophytes and often mistaken for algae, which are not.

There are four genera, Lemna, Spirodela, Wolffia, and Wolffiella, amongst 40 other species identified so far.

All species produce tiny, flowers and seeds. Some species of duckweed defy low temperatures by forming a special starchy "survival" frond known as a 'turion' that sinks to the bottom of the water where it remains dormant until rising temperatures.

Morphology

The four a main species of Duckweeds are currently considered the smallest of all flowering plants. Individual duckweed plants have a frond, no leaf, stem, or specialized structures; the entire plant consists of a flat, ovoid frond as shown in figure 1 below. Many species may have hair-like rootlets which function as stability organs; a long thin, long flagello-like or tail-like root submerges into the water.

Spirodela have the largest fronds, measuring as much as 20 mm across or the size of a on your pinky, while those of Wolffia species are 2 mm or less in diameter.

Figure 1.

End of book preview here.