BRIEFING NOTE

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EVALUATION OF SUPERMARKET FOOD WASTE AS PARTIAL REPLACEMENT OF COMMERCIAL FEED IN MOZAMBIQUE TILAPIA CULTURE

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KEY FINDINGS

The project investigated the composition and seasonal variation of food waste (fruit and vegetables) from a retail store, mainly focusing on its potential as raw ingredients for Red Mozambique tilapia (*Oreochromis mossambicus*) feed. The results demonstrate the prevalence of food waste (FW) throughout the year but indicate that its composition varies seasonally in some fractions, highlighting the urgent need for strategies to optimize waste management and promote environmental sustainability. Subsequently, following safety assessments of the waste fragments, a six-week feeding trial was conducted using formulated feeds derived from FW flour within a controlled laboratory setting. Results demonstrate that utilizing FW, which might otherwise be discarded and can be obtained at lower prices, can partially be used as ingredients to replace commercial tilapia feed, significantly reducing the overall cost of feed production. This offers promising avenues for sustainable aquaculture practices and waste management solutions.

INTRODUCTION

According to the Food and Agricultural Organization of the United Nations, approximately 1.3 billion tons of food, representing about one-third of global production, is lost or wasted annually. These wastages occur during post-harvest handling, storage, processing, distribution, and consumption, with over 40% of losses happening during post-harvest and processing in low and middle-income countries and at retail and consumer levels in High-income countries. This escalating generation of food waste (FW) has environmental consequences. While traditional waste management methods such as landfilling and incineration are commonly used, they are not sustainable. Thus, "food rescue" programs offer a promising solution for recycling FW, presenting an economically feasible and reliable technology. Retail FW remains a grave concern, stemming from factors like product damage, storage, non-compliance, and inaccurate demand predictions exacerbated by power rationing or "load shedding". Unfortunately, such waste often goes unquantified. Retail stores, however, are intermediaries between producers and urban consumers, especially in areas like Mthatha, where produce travels long distances from neighbouring provinces or District Municipalities. With urbanization on the rise, the pressure on farmers increases due to the growing influence of multinational retail chains. Retail waste adds to the global FW crisis, contributing significantly to landfill and greenhouse gas emissions and exacerbating climate change.

Conversely, fish consumption is surging worldwide and is projected to increase by over 2.5 per cent annually in developed and developing nations. The demand for farmed fish will skyrocket to 93 million tonnes by 2030. With the global population set to hit 9.6 billion by 2050 and over 800 million people facing malnutrition, the challenge intensifies to meet the growing demand for seafood while preserving natural resources and the environment. This trend reflects the pressing need for a sustainable and affordable source of animal protein, given stagnant capture fisheries, increased per capita consumption, population growth, and rising incomes. This necessitates urgent exploration of alternative high-quality ingredients to sustain aquafeed demand, estimated to reach 60 million tons. This valorizing FW in fish food could reduce greenhouse gas emissions, mitigate climate change, enhance resource efficiency, and improve the resilience of wild fish stocks and communities dependent on fisheries.

METHODOLOGY

The study aimed to investigate FW's seasonal variation and composition in a retail store and evaluate its temporal proximal composition as raw materials for aquafeed. FW sampling was done from four retail store departments monthly for 12 months. Samples were processed, dried, and milled into fine flour. Studies were conducted to determine the proximal chemical composition of 3 diets. Diet 1, 100% commercial diet (control); Diet 2 (75% control: 25% FW; Diet 3 (50% control: 50% FW). Safety analyses were evaluated, and feed formulated. Subsequently, the efficacy of the formulated feed was assessed in a six-week feeding trial.

MAIN RESULTS

As depicted in Figure 1, the findings highlight the unparalleled dominance of vegetables across all seasons, displaying percentages of 45% in autumn, 54.8% in summer, 58% in winter, and a staggering 65.7% in spring. Following closely, fruits emerge as the next substantial category, showing significant proportions of 34% in autumn, 30% in winter, 26.2% in summer, and 18.1% in spring. Conversely, bakeries emerge as the least impactful contributors throughout the seasons, registering modest figures of 12% in winter, 15.2% in spring, 16.7% in summer, and 21% in autumn. Notably, grains only appear during spring and summer, with scant percentages of 1.0% and 2.4%, respectively. The Seasonal dynamics of individual FW fractions are shown in Figure 2.

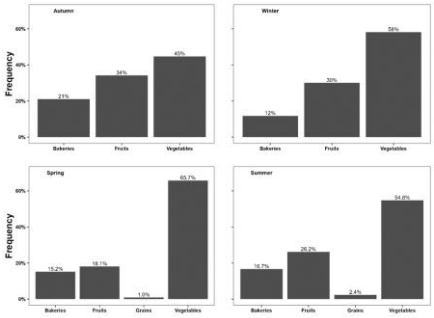

Figure1. Annual frequencies of FW fractions per season.

Among the diets, diet 1 exhibited the highest overall specific growth rate (Fig. 3), reaching 1.54±0.12, surpassing diet 3 (0.86±0.57) and diet 2 (0.74±0.62).

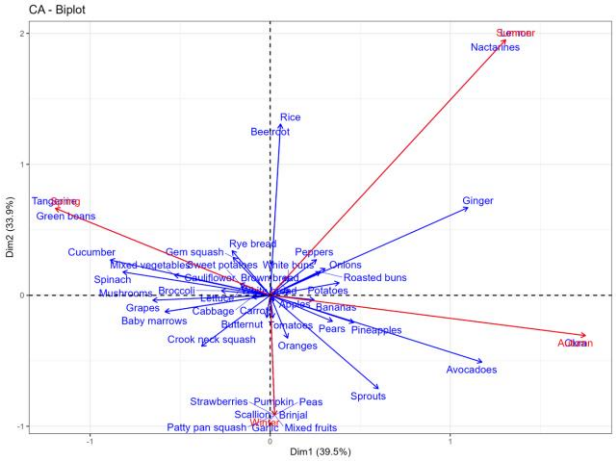

Figure 2. Seasonal dynamics of individual FW fractions.

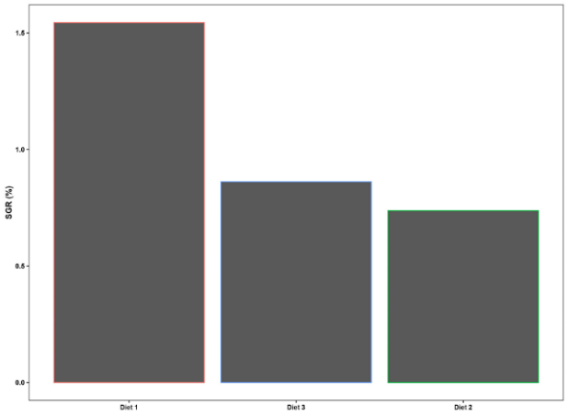

Figure 3. Variation in specific growth rate (SGR) of fish fed the three diets for six weeks.

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