UNIVERSITI TEKNOLOGI MARA

FORMULATED WILD CAROB BAR, ITS STORAGE QUALITY ASSESSMENT AND ACCEPTABILITY: AN EXTENDED THEORY OF PLANNED BEHAVIOUR

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ABSTRACT

Chocolate is one of the most popular cocoa-based products in the market, with an enormous market value of approximately 100 billion USD. However, cocoa production may not meet future chocolate demands. In light of this, carob (Ceratonia siliqua L.) has emerged as a potential alternative to cocoa due to its comparable intrinsic constituents. Despite low agriculture, Cyprus has abundant carob plants, cultivated and wild species. Cultivated carob is used for food products, while wild carob is mainly used for animal feed. Despite being underutilized, wild carob is rich in nutrients and has a cocoa-like aroma. Motivated by the underutilization of wild carob and its rich nutritional composition, this study focused on harnessing wild carob to produce powder as an alternative to cocoa powder in the production of bar products. The study also aimed to evaluate the acceptability of wild carob bars (WCB) among the Cypriot populace. Initially, a preliminary study was conducted to determine the suitable roasting time and temperature for producing wild carob powder (WCP) and formulating wild carob bars (WCB). Physiochemical analysis was conducted on WCP and compared to cocoa powder, while physical, microbial, and sensorial analysis was performed on WCB and compared to chocolate bars over a 12-week duration at room temperature and 4 degrees Celsius. Additionally, an acceptability study was conducted to determine the purchase intention of Cypriot consumers towards wild carob bars. A quantitative survey was carried out on 388 Cypriot consumers from the six largest cities in Cyprus, utilizing Google Forms and various social platforms for data collection. The gathered data was analysed using SPSS for frequency and descriptive analysis, while smart PLS was used for the measurement model and structural model. Based on the results of the preliminary study, roasting at 130°C for 30 minutes was identified as the suitable parameter for producing WCP. Physical analysis revealed that WCP had 31.04% lower water activity and 6.8 times higher milling yields than cocoa powder, while exhibiting similar colour properties. Proximate analysis showed that WCP had significantly lower energy, carbohydrate, crude fat, protein, ash, and moisture content, while having significantly higher dietary fibre compared to cocoa powder. In terms of shelf-life, WCB exhibited significantly lower water activity (0.415 aw) but no difference in terms of colour properties when compared to chocolate bars. Moreover, WCP was found to improve the shelf life of the bar, with total plate count and yeast & mould count within the standard limits of <1.0x104 and ≤5 cfu·g-1, respectively. Additionally, WCB showed higher overall sensorial acceptability at both three months (4.20) and 0 days (3.95) of storage compared to chocolate bars (3.75). Furthermore, the acceptability study revealed significant relationships between Knowledge (K) and Purchase Intention (PI), as well as between Sensory Characteristics (SC) and PI. However, insignificant relationships were observed between Consumer Innovativeness (CI) and PI, and between Subjective Norms (SN) and PI. On the other hand, no mediating effect was observed between CI and A. Descriptive analysis indicated that most Cypriot consumers willing to purchase WCB if it were available in the market. Overall, this study explores wild carob powder as a cocoa powder alternative in bar production, addressing its underutilization. The analysis of physicochemical properties, shelf-life, and consumer acceptance provides valuable insights into the feasibility of wild carob powder as a sustainable alternative for bar production. This research offers a promising solution to meet future demands in chocolate industry and concurrently boosting the agricultural income of Cyprus.

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INTRODUCTION

1.1 Introduction

Cyprus is an island located in the Mediterranean Sea with an intense Mediterranean climate of long dry summers that span the months of mid-May and mid-October and moderate winters spanning from December to February (Amber, 2017). Summers and winters in Cyprus are interspaced by the brief autumn and spring seasons (Carver et al., 2002). Cyprus's geographical and historical profile is highly esteemed and regarded as one of the world's best tourist destinations (Plecher, 2021). Hence, the nation devotes most of its resources to tourism, making it one of the nation's primary sources of revenue. However, 1.7% of total GDP was obtained from agricultural practises, which have been marginalised as a result of the nation's engrossed devotion towards tourism and the climate conditions (WBN, 2021).

Notwithstanding, Cyprus is endowed with carob plants that blossom despite the climate conditions. Carob (*Ceratonia siliqua* L.), a native plant in Cyprus, has two species, the cultivated and wild carob. The cultivated species are grown mainly in maquis areas. The wild species grow almost everywhere in Cyprus, involving the Akamas region, Episkopi, Lemesos forest, Lefkara, Kalavasos, Stavrovouni, Kyrenia mountain range, and Karpaz peninsula (MOA, 2008). The carob tree is drought-tolerant with minimal soil requirements as it thrives on various soil types, such as rocky, dry, and sloping soil if it is slightly fertile. This tree is part of the Leguminosae family, originates from the Middle East, and is grown mainly along the Mediterranean coast. It is also considered one of the most variable commodities in the Cypriot economy through its products, such as syrup, powder, candies, and others (Christou et al., 2019).

The traditional carob-based products are readily found in Cypriot markets because Cyprus is geographically located in the region where the plant originated many years ago. Evidence showed that this tree also existed in the highlands of Southern Arabia. Zohary (2002) mentioned that carob trees existed before the "advent of horticulture" in the Eastern Mediterranean region. Cyprus was the third-largest exporter of carob globally before moving from an agriculture-based economy to a financial services centre, whereby the country's carob production declined (Busfield, 2020).