Enhancing Customer Experience and Millet Product Value Using Data Analytics

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Abstract **— This study examines the amounts of glycinamide in rice and millet, discovering that rice contains significantly higher amounts of this compound, which inhibits the absorption of vitamins and other essential nutrients. Conversely, millets have been demonstrated to possess reduced levels of glycinamide, indicating their superior nutritional profile, being rich in calcium and vitamins. The study aims to raise awareness about the superior nutritional value of millets over rice across various demographic groups in Bangalore, including individuals aiming for weight loss, workers, housewives, students, and senior citizens. A range of methods was employed to gather extensive data, such as web scraping from dietary databases and health forums, in-person surveys at shopping malls to capture real-time customer activity, and in-depth analyses of blogs and articles. The objective is to highlight the diverse range of consumption habits and preferences identified across different population segments through a multimodal approach. The information gained from this study is intended to assist in developing and implementing targeted awareness efforts, promoting millets as a more nutritious and healthful food option for a variety of demographic groups in Bengaluru.**

Keywords**— Nutrition, web scraping, Machine learning, Forecasting systems, Patterns of consumption.**

I. INTRODUCTION

The heightened emphasis on more healthful food options has elevated millets to prominence as an excellent substitute for conventional mainstays such as rice. This study compares the glycinamide content of rice and millets, finding that rice contains larger amounts of this molecule, which prevents the absorption of vitamins and other vital elements. Conversely, millets exhibit more nutritional benefits, including higher calcium and vitamin content, due to their lower levels of glycinamide. The goal of this research is to increase the knowledge of various Bangalore demographic groups—including individuals trying to lose weight, housewives, workers, students, and the elderly—regarding the health benefits of millets. A thorough data collection method was employed, encompassing site scraping, in-store surveys, and a review of pertinent blogs and articles. This multidimensional approach secured a solid dataset reflecting a range of consumption habits and preferences. The investigation was expanded to include social media sites to gain a better understanding of millet awareness and consumption. The study sought to identify geographical disparities and public perceptions by assessing the mood and awareness of millets in various parts of Bangalore. These observations are essential for developing well-informed advocacy and marketing plans tailored to different target audiences. Advanced data analysis methods were utilized to extract valuable information from the gathered data. A variety of machine learning techniques were employed, including LightGBM, Cat Boost, XGBoost, gradient boost, ridge, random forest, and random forest regression. Several models demonstrated high accuracy, reaching up to 99%. These forecasting tools provided a comprehensive understanding of the variables impacting millet intake. Thorough visual dashboards were created using Power BI to enhance the readability and visualization of the results. These visualizations facilitated better decision-making and result communication by presenting the data in an understandable and straightforward manner. This study underscores the value of targeted awareness initiatives, in addition to the nutritional advantages of millets. By understanding the consumption habits and preferences of various demographic groups, millet consumption can be more effectively encouraged, thereby enhancing dietary health in Bangalore. The conclusions of this research offer a data-driven basis for advocating public health and promoting millets as a more nutritious food choice. The research found that areas with greater knowledge levels often had easier access to health and nutritional resources, highlighting the importance of disseminating information equitably. This implies that targeted community initiatives and partnerships with local healthcare institutions have the potential to significantly increase millet intake in marginalized regions.

II. LITERATURE REVIEW

Increasing the Millet Product Value and Customer Experience Millets, often known as "Nutri-cereals," are gaining popularity due to their superior nutritional value and health advantages. The nutritional advantages of foxtail millet are highlighted by Yang et al., noting the plant's high levels of dietary fiber, vitamins, and proteins, which aid in treating diabetes, cancer, and cardiovascular illnesses [1]. Pal et al. emphasize the use of 2.4 GHz RF Received Signal Strength for node separation in Wireless Sensor Networks (WSNs) in agricultural settings to maintain network connectivity when vegetation density varies, ensuring effective monitoring of millet and rice vegetation [2]. Maitra points out the feasibility of brown-top millet cultivation in drylands, given global warming, due to its resistance to harsh weather

[3]. Drs. Brindadevi and Premalatha examine how nutritional interventions based on millet can affect childhood obesity by analyzing children's BMI, food habits, and physical activity levels using machine learning approaches [4]. Kwame Ofosu et al. evaluate four millet grain cultivars for their antioxidant and antidiabetic qualities, emphasizing the large phenolic content and possible health benefits [5]. Lokeswari and Mahendran discover improvements in the total soluble solids and conductivity of ready-to-eat pearl millet flakes and puffs through plasma bubbling [6]. Gandhimeyyan Renganathan et al. examine the nutritional advantages of barnyard millet, noting its high iron and zinc levels, which surpass those of other cereals, and its resistance to biotic and abiotic stressors [7]. Balli et al.'s analysis reveals a rise in phenolic content during the fermentation process of millets, amplifying the grain's health advantages [8]. Wang et al. discover modifications in nitrogen fertilization that may impact the yield and quality of prose millet protein [9]. Ghatak et al. analyze the drought resilience mechanisms of pearl millet and wheat through proteome analysis, demonstrating millet's greater adaptability [10]. Srivastava et al. explore conventional and genomic breeding techniques to create drought-resistant pearl millet variants [11]. Giridharan and Sakthivel conclude that millet diets are highly beneficial for controlling metabolic diseases in diabetics [12]. Abah et al. examine the nutritional makeup, useful qualities, and culinary uses of millet grains, highlighting their high starch and carbohydrate content and advantageous functional traits [13]. Gairhe et al. emphasize the contribution of finger millet production and trade to smallholder farmers' food security in Nepal [14]. Bunkar et al. highlight the significance of kodo millet for low-income communities in developing nations due to its resistance to drought and extended shelf life [15]. Integrated studies on foxtail millet through GWAS, MWAS, and mGWAS shed light on precision agriculture and genotype-dependent microbial impacts on plant growth and yield [16]. Crop diseases pose a serious threat to global food security, with pearl millet being particularly vulnerable to rust and blast diseases. Kundu et al. provide a methodology for automating disease prediction in pearl millet using machine learning and the Internet of Things (IoT) with the "Automatic and Intelligent Data Collector and Classifier" (AIDCC) system [17]. Gebreyohannes et al. (2021) reveal significant obstacles to Ethiopian finger millet production, including abiotic stressors like drought and low soil fertility, and biotic challenges like diseases and pests. Additionally, restricted access to better varieties, limited resources, and insufficient market access create socioeconomic barriers for smallholder farmers. Despite these challenges, finger millet has promising prospects due to its gluten-free nutritional profile and high concentrations of vital minerals, making it ideal for global healthy food demand. Gebreyohannes et al. discuss breeding recommendations for mitigating biotic and abiotic stressors to realize this potential [18]. Ning et al. propose a blockchain-based millet tracking system to ensure security and transparency in the agricultural supply chain, enhancing consumer confidence [19]. Rao et al. examine the effects of microwave treatment on the physical and functional qualities of foxtail millet flour, discovering increases in solubility and water absorption capacity, which are critical for its use in the food industry [20]. These studies collectively highlight how millets can be utilized to improve product value and customer experience through innovative farming methods, health benefits, and advanced data analytics.

III. METHODOLOGY

Data was automatically collected from online sources using web scraping techniques, providing insights into the consumption patterns and preferences of these grains. Additionally, firsthand data on the eating preferences of various demographic groups in Bangalore was gathered through questionnaires conducted at several of the city's shopping centers. Machine learning prediction algorithms were employed to analyze and forecast patterns in the gathered data, thereby enhancing the accuracy of the dataset. Blogs and articles were also reviewed, which enriched the understanding of rice and millet consumption patterns and nutritional awareness. This comprehensive approach facilitated a sophisticated understanding of the nutritional advantages of millets and the development of tailored strategies.

Proposed Methodology: The methodology combines social media sentiment analysis with demographic data to uncover geographical differences in millet intake and sentiment, aiming to measure and improve millet awareness in Bangalore. The model predicts the likelihood of millet consumption based on social media sentiment and demographic data using various machine learning regression algorithms. The prediction accuracy of these models informs tailored advocacy and promotional strategies.

Table 1: Sample dataset

SI.NO	DATE	LOCATION	Category	Product	Quantity	Unit Price	Selling price	Total sales	Customer ID	Rating	Review	Age group	Occupation	Sex	Income
1	1/3/23	Yelahanka	Snacks	Corn balls	12	30.24	36.24	234	861	3	Descent	Young	Student	M	Low
2	2/3/23	Hebbal	Noodles	Barnyard millet noodles	21	20.24	28.24	435	444	2	Not impressive	Older	Retired	F	Mid
3	3/3/23	K R Puram	Pasta	Foxtail millet pasta	31	19.88	38.24	123	168	4	Good	Middle	Working professionals	M	High

Gathering of Data: To ensure representation from both urban and suburban areas, survey participants were selected from various sites within Bangalore. This geographic variety facilitated the recording of a wide range of dietary practices influenced by factors such as access to different food options, cultural background, and socioeconomic status. Data was obtained from individuals at retail centers, residential areas, and educational establishments to capture information about the eating habits and nutritional consciousness of various urban communities.

Surveys: Surveys targeted a variety of demographic groups, including those interested in weight loss, workers, housewives, students, and the elderly. These surveys were conducted throughout Bangalore's malls**.**

Web Scraping: Information was gathered from social media sites such as Facebook and Twitter to determine public sentiment and awareness of millet consumption. Tools such as Beautiful Soup, Selenium, and Scrapy were utilized for this purpose.

Secondary Data: Papers, blogs, and previous research on the nutritional advantages of millet consumption were examined.

Preparing Data:

Cleaning: Missing values were handled, and redundant and unnecessary data was eliminated. Data was categorized into relevant groups, and categorical variables were encoded in preparation for analysis.

Sentiment Analysis: Natural language processing (NLP) techniques were used to categorize social media posts about millets as favorable, unfavorable, or neutral.

Algorithms for machine learning:

- Ridge Regression
- Forest Regression at Random
- Gradient Boost Regression
- Regression of XGBoost
- Regression of LightGBM
- Regression of CatBoost

Dataset Description:

Customer ID: A unique identifier assigned to each customer.
Age: The customer's age in years.
Gender: The gender (male or female) of the customer.
Occupation: The customer's occupation (retired, homemaker, employed, or student).
Location: The customer's location, which can be Hebbal, Yelahanka, Koramangala, Jakkur, or Malleswaram.
Awareness Score: A numerical representation of the customer's awareness level of a product or service, ranging from 0 to 100.
Sentiment Score: A numerical representation of the customer's attitude towards a product or service, potentially ranging from -1 to 1 (Negative, Neutral, Positive).
Consumption Frequency: The frequency at which a customer uses a product or service (Daily, Weekly, Seldom, Occasionally).

Assessment of the Model:

Various models were assessed for their ability to predict millet consumption habits, achieving accuracy rates ranging from 89% to 98-99%. Models with the highest accuracy (98-99%) were deemed most effective in predicting millet consumption patterns.

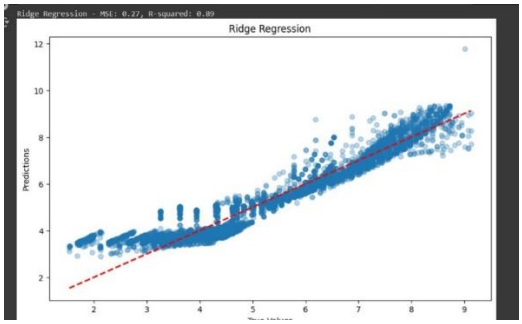

Fig 1: (Ridge Regression model) MSE: 0.27, R-squared: 0.89

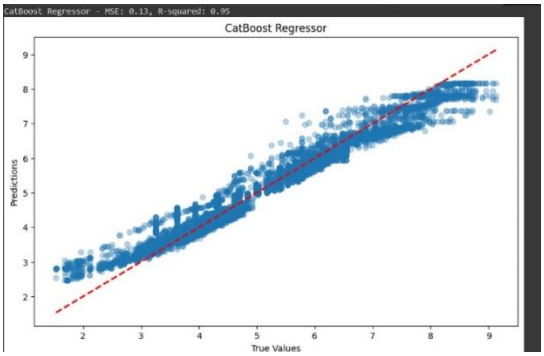

Fig 2: (CatBoost Regressor Model) MSE: 0.13, R-squared: 0.95

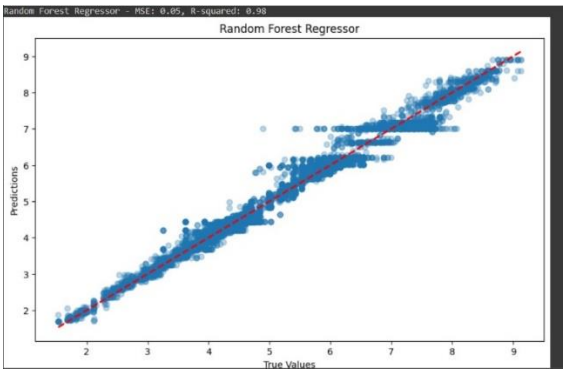

Fig 3: (Random Forest regressor) CatBoost Regressor

Table 2: Customer segmentation and behavior

Cust. ID	Age	Gender	Occupation	Location	Awareness Score	Sentiment Score	Consumption frequency
001	25	F	Student	Hebbal	85	Positive	Rarely
002	45	F	Retire	Yelahanka	60	Neutral	3 times/week
003	35	M	Employee	Jakkur	75	Negative	daily

Understanding Customer Demographics: Analyze the distribution of customers across age, gender, and occupation.

Identifying Customer Segments: Group customers based on shared characteristics such as location, awareness score, or sentiment score.
Targeted Marketing: Develop marketing campaigns tailored to specific customer segments**.**
Predicting Customer Behavior: Companies can leverage machine learning to forecast customer purchases. These models analyze customer data to predict the likelihood of future purchases.

Table 3: Parameters used in the model

Parameter	Value/Code
Alpha (Ridge Regression)	uniform (0.1, 1.0)
n_estimators (Random Forest)	randint(10, 50)
learning rate (Gradient Boosting)	uniform (0.01, 0.1)
iterations (CatBoost)	50
num_leaves (LightGBM):	randint(10, 30)

IV. DATA ANALYSIS

Analyzing Exploratory Data (EDA):
Provide a basic statistical summary, including metrics such as the mean, median, and standard deviation for numerical data (Age, Sentiment Score, Awareness Score). For categorical data (e.g., gender, occupation, location, frequency of consumption), compute frequencies and percentages. Create visually appealing representations of the data using boxplots and histograms for numerical data distribution, and pie charts or bar charts for categorical data distribution. Identify missing values and decide on the appropriate handling method (e.g., imputation or deletion).

Segmenting Customers:
Demographics: Segment by gender and age groups.
Location: Sort customers by region or city.
-Sentiment and Awareness: Group customers based on score ranges (positive/neutral/negative sentiment, High/Medium/Low awareness).
Frequency of Consumption: Categorize customers as Regular, Infrequent, or Seldom Users. Compare these segments to identify differences. Compare average scores (e.g., emotion or awareness) between age groups or geographical areas.

Analysis of Customer Behavior:
Examine the relationship between customer attributes and consumption frequency. Identify specific demographics or locations associated with higher consumption rates. Use correlation analysis to find relationships between variables (e.g., awareness score and sentiment score).

Optional Predictive Modeling: Depending on your objectives, create models to forecast customer behavior, such as estimating the probability of customer churn or predicting future purchasing patterns.

Tools for Analyzing Data:
Python-based programming languages (utilizing libraries like Pandas, NumPy, and Scikit-Learn).
Spreadsheet programs with data analysis capabilities.
Business intelligence (BI) tools.

		Location			
Sex	Occupation	Hebbala	Mallesh..	Yelahan..	Yeshwa..
Female	Retiree	215,829	221,529	232,545	220,480
	Student	207,198	241,712	218,973	219,461
	Working Professional	163,850	185,064	174,145	172,275
Male	Retiree	190,563	187,906	165,432	177,412
	Student	176,760	180,287	177,393	169,758
	Working Professional	211,407	209,508	209,214	220,223

Fig 4: Examining Gender-Based Consumption Trends in Bangalore

Health-Conscious Consumers: Approximately 28% of individuals consume millets for health-related reasons. Millets are renowned for their numerous health benefits and high nutritional value. Taste Preferences and Weight Management: 15% of millet consumers aim to manage their weight. Taste is a crucial factor for 14% of millet consumers. Enhancing the taste of millet products could lead to increased consumption.

Knowledge and Customs: While 91% of respondents express concern about their health, only 40% are confident about the safety of millets. Millet consumption is influenced by increasing awareness and family traditions**.**

Obstacles to Consumption: Due to millets being uncommon in households, 40% of individuals do not consume them frequently. Twenty-two percent of individuals dislike the taste of millets. Urban consumers rely on social media platforms for information, suggesting that utilizing social media could promote millet consumption.

Recognition of Millets: Various methods can be employed to identify millets. Visual recognition of different millet seed sizes and shapes is helpful. Finger millet seeds are long and thin, while foxtail millet seeds are small and elongated. Color can also be indicative; for example, pearl millet flour is pale yellow, whereas finger millet flour has a reddish tint. Ingredient labels on processed foods often specify millet types. Other methods include tactile differences, taste, and technological methods such as web scraping and blog analysis.

Source of Information: Web scraping can be used to gather information on millet varieties, prices, and consumer perceptions from online retailers and restaurant applications. Analyzing social media conversations and posts can provide insights into millet consumption patterns and attitudes in Bangalore. Regional content from food bloggers or writers can offer information on prominent millet-serving restaurants, regional consumption trends, and adoption challenges. Surveys conducted in various Bangalore areas can provide insights into millet knowledge, consumption habits, perceived health benefits, and barriers to consumption. Street surveys, while providing a broad understanding of awareness levels, may miss certain demographic trends due to their random nature.

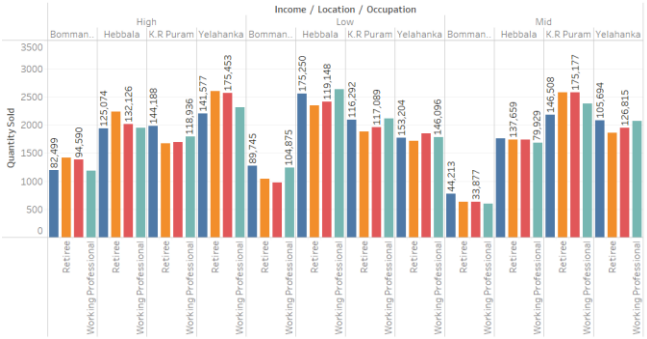

Fig 5: The probable gender gap in consumption across Bangalore locations

The bar graph illustrates the consumption patterns of four demographic groups in Bangalore: housewives, retirees, working professionals, and students. The x-axis represents the demographic groups, while the y-axis displays the consumption quantity. The graph visually presents data that may reveal significant socioeconomic trends related to gender and occupation in relation to Bengalurians spending patterns. Although the description lacks specific numbers and comparisons, it likely demonstrates differences in consumption among these groups and locations. Based on this visualization, working professionals in the Hebbal area purchase and consume more millets compared to other groups. Conversely, students in the Bommanahalli neighborhoods have the lowest consumption rate.

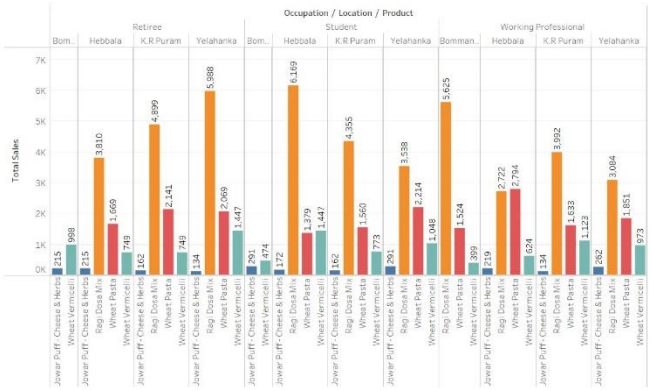

Fig 6: Demographic Consumption Patterns in Bangalore based on their occupation

The bar graph presents data on various items, locations, and occupations. Locations such as Bommanahalli, Hebbal, K.R. Puram, and Yelahanka are listed, along with occupations including Retiree, Student, and Working Professional. The x-axis represents a range of tech skills, while the y-axis displays numerical values ranging from 0 to 7K, indicating the number of individuals associated with each skill set in the specified categories and locations. The graph uses color coding to show the distribution of tech skills across different demographic groups, providing insights that can be useful for workforce planning and identifying educational needs. The graph highlights that students in the Hebbal area show a higher interest in purchasing ragi dosa mix compared to other millet products, with a rate of 6,169. Conversely, the least popular product among retirees and working professionals, with the same quantity, is jowar puff cheese and herbs at 134.

V. RESULTS AND DISCUSSIONS

This study examined people's awareness of millets on social media across various geographical areas. Analysis of demographic data and millet consumption trends using machine learning models revealed high levels of accuracy.

Table 4: Accuracy of models

Model	Accuracy
Rigde regression	89%
Random Forest	98%
CatBoost	95%
XGBoost	99%

High Precision Model and Upcoming Actions, it is crucial to look beyond the top score, especially the high accuracy of XGBoost (99%), as it indicates that the models have captured significant associations. This is important for several reasons:

Model Choice: While XGBoost may have the highest accuracy, other considerations are essential. For instance, Ridge Regression, despite its lower score (89%), offers better interpretability, making it easier to understand how different factors impact millet consumption, thus providing insights into the underlying reasons behind the statistics. Generalizability and Overfitting: Models like Random Forests and XGBoost, while strong, may be prone to overfitting. Therefore, it is important to test these models on hypothetical data to ensure they perform well in new situations and do not make predictions that do not hold up in real-life scenarios. Performance Specific to Location: Assessing the model's performance across different geographical areas is crucial. Did a specific model perform better in particular settings? Understanding these differences can help in creating focused geographic strategies. Regional Distinctions: The study effectively identified regional differences in millet consumption habits and social media engagement levels. This underscores the importance of adapting advocacy and marketing strategies according to the specific target audience.

Considerations include: Which regions have specific dietary and cultural preferences that may influence the types of millet consumed or the way people engage with millet-related content on social media? Which social media platforms are most popular in different regions? Understanding platform preferences allows for more targeted messaging. Are there influential figures in the area who could serve as allies in promoting millets? Engaging with local leaders can enhance outreach and trust in specific regions. Understanding Social Media Insights: Social media data offers more than just engagement levels. By delving deeper, one can extract valuable insights such as:

Topic Modelling: Applying topic modelling techniques can reveal recurring themes and conversations around millets. This includes popular millet dishes, highlighted health benefits, and perceived obstacles to including millets in the diet. This information can be used to tailor messaging to meet specific needs and interests.

Moving Forward: Using Insights for Specific Strategies based on social media analytics, the comprehensive results can be used to develop strategies that effectively promote millet consumption and sustainable behaviors. The following actions are recommended:

Select the Model and Examine Feature Importance: Choose the best model based on your needs (accuracy vs. interpretability) and performance across different regions. Then, analyze feature importance to gain further insight into the model's predictions. This allows for a focus on areas with the most impact by identifying demographic characteristics and social media data points most strongly associated with millet consumption.

Create Regionally Specific Strategies: Utilize the understanding of social media trends and geographical differences to develop customized advocacy and marketing plans for each region.

VI. CONCLUSION

This study examined the nutritional advantages of millets over rice, highlighting how their decreased glycinamide content promotes improved nutrient, calcium, and vitamin absorption. Our study aimed to increase knowledge of these advantages among different Bangalore demographic groups, such as those who are trying to lose weight, workers, housewives, students, and senior citizens. We gathered information through a combination of web scraping with programs like Scrapy, Beautiful Soup, and Selenium, surveys carried out in shopping centers, and evaluations of blogs and articles to comprehend consumption trends and preferences. This thorough method offered insightful information about the eating practices and knowledge levels of various groups. To comprehend regional variances and mood, we also examined social media awareness of millets across several Bangalore areas. This assisted us in creating well-informed advocacy and marketing. Advanced machine learning techniques, such as Gradient Boost Regression, XGBoost Regression, LightGBM Regression, CatBoost Regression, Random Forest Regression, and Ridge Regression, were used in our data analysis. The models proved

to be quite accurate; the top-performing models might reach up to 99% accuracy. Our conclusions were further validated by a Power BI visualization of the data. The study's findings highlight how crucial it is to encourage millet consumption to promote nutritional health. We can effectively advocate for the inclusion of millets in the diet and improve the general health and nutrition of different demographic groups in Bangalore by focusing awareness campaigns and utilizing social media insights. This study offers a strong basis for further research and projects that try to improve public health by encouraging healthier food choices.

REFERENCES

[1] Tongshuai Yang, Influences of four processing methods on main nutritional components of foxtail millet: dx.doi.org/10.1016/j.gaost.2022.06.005

[2] Pankaj Pal, Rashmi Priya Sharma, 2.4 GHz RF Received Signal Strength Based Node Separation in WSN Monitoring Infrastructure for Millet and Rice Vegetation, 10.1109/JSEN.2021.3083552

[3] Sagar Maitra Centurion University Potential horizon of brown-top millet cultivation in drylands, DOI: 10.31830/2454-1761.2020.012

[4] Dr. M. Brindadevi, Dr.G.Premalatha, M.Nalini, Dr Chelladurai Iyyanar, Vettrivel Arul, A Machine Learning Strategy for Reducing Childhood Obesity Using Millet, 979-8-3503-8420-8/23/$31.00 ©2023 IEEE

[5] Fred Kwame Ofosu, Phenolic Profile, Antioxidant, and Antidiabetic Potential Exerted by Millet Grain Varieties, doi:10.3390/antiox9030254

[6] R. Lokeswari and R. Mahendran, Effect of Plasma Bubbling on Textural and Engineering Properties of Ready-to-Eat Pearl Millet Flakes and Puffs, Digital Object Identifier 10.1109/TPS.2021.3138755

[7] Vellaichamy Gandhimeyyan Renganathan1,2, Chockalingam Vanniarajan1, Adimoolan Karthikeyan2 and Jegadeesan Ramalingam2, Barnyard Millet for Food and Nutritional Security: Current Status and Future Research Direction, 10.3389/fgene.2020.00500

[8] Diletta Balli 1, Maria Bellumori 1, Laura Pucci 2, Morena Gabriele 2, Vincenzo Longo 2, Paolo Paoli 3, Fabrizio Melani 1, Nadia Mulinacci 1, and Marzia Innocenti 1, Does Fermentation Really Increase the Phenolic Content in Cereals? A Study on Millet, doi:10.3390/foods9030303

[9] Honglu Wang 1, Dongmei Li 1, Chenxi Wan 1, Yan Luo 1, Qinghua Yang 1, Xiaoli Gao 1 and Baili Feng 1,2, Improving the Functionality of Proso Millet Protein and Its Potential as a Functional Food Ingredient by Applying Nitrogen Fertilizer, doi.org/10.3390/foods10061332

[10] Arindam Ghatak1†, Palak Chaturvedi1 * †, Gert Bachmann1, Luis Valledor2, Živa Ramšak3, Mitra Mohammadi Bazargani4, Prasad Bajaj5, Sridharan Jegadeesan6, Weimin Li1, Xiaoliang Sun7, Kristina Gruden3, Rajeev K. Varshney5 and Wolfram Weckwerth1,7, Physiological and Proteomic Signatures Reveal Mechanisms of Superior Drought Resilience in Pearl Millet Compared to Wheat, Doi: 10.3389/fpls.2020.600278

[11] Rakesh K. Srivastava1 *, O. P. Yadav2 , Sivasakthi Kaliamoorthy1 , S. K. Gupta1 ,Desalegn D. Serba3 , Sunita Choudhary1, Mahalingam Govindaraj1, Jana Kholová1 ,Tharanya Murugesan1 , C. Tara Satyavathi4 , Murali Krishna Gumma1 , Ram B. Singh1 , Srikanth Bollam1 , Rajeev Gupta5 and Rajeev K. Varshney1,6 Breeding Drought-Tolerant Pearl Millet Using Conventional and Genomic Approaches: Achievements and Prospects, Doi: 10.3389/fpls.2022.781524

[12] R. Vedamanickam1, P. Anandan1*, G. Bupesh2, S. Vasanth2, Study of millet and non-millet diet on diabetics and associated metabolic syndrome, /341070917

[13] C. R. Abah1*, C. N. Ishiwu1, J. E. Obiegbuna1 and A. A. Oladejo2, Nutritional Composition, Functional Properties and Food Applications of Millet Grains, DOI: 10.9734/afsj/2020/v14i230124

[14] Samaya Gairhe ,Devendra Gauchan ,Krishna Timsina, Prospect and potentiality of finger millet in Nepal: Nutritional security and trade perspective, DOI: 10.3126/janr. v4i2.33657

[15] Durga Shankar Bunkar1*, S K Goyal2, Kamalesh Kumar Meena3 and Virendra Kamalvanshi, Nutritional, Functional Role of Kodo Millet and its Processing: doi.org/10.20546/ijcmas.2021.1001.229

[16] Yayu Wang 1,9, Xiaolin Wang2,9, Shuai Sun 1,3, Canzhi Jin1,4, Jianmu Su1 , Jinpu Wei 1 , Xinyue Luo1,4, Jiawen Wen1,4,Tong Wei1 , Sunil Kumar Sahu 1 , Hongfeng Zou1 , Hongyun Chen 1 , Zhixin Mu5 , Gengyun Zhang1 , Xin Liu 1 , Xun Xu 1,6, Lone Gram 7 , Huanming Yang1 , Ertao Wang 2 & Huan Liu1,8, GWAS, MWAS and mGWAS provide insights into precision agriculture based on genotype-dependent microbial effects in foxtail millet, /doi.org/10.1038/s41467-022-33238-4

[17] Nidhi Kundu 1, Geeta Rani 1, *, Vijaypal Singh Dhaka 1, Kalpit Gupta 1, Siddaiah Chandra Nayak 2, Sahil Verma 3, Muhammad Fazal Ijaz 4, * and Marcin Wo ´zniak 5, IoT and Interpretable Machine Learning Based Framework for Disease Prediction in Pearl Millet, doi.org/10.3390/s21165386

[18] Adane Gebreyohannes 1,2, *, Hussein Shimelis 1, Mark Laing 1, Isack Mathew 1, Damaris A. Odeny 3 and Henry Ojulong 3 Finger Millet Production in Ethiopia: Opportunities, Problem Diagnosis, Key Challenges and Recommendations for Breeding, doi.org/10.3390/su132313463

[19] Yingying Ning, Tao Wang, Tongyang Liu, The Traceability of Millet Based on Blockchain Smart Contracts in Agricultural Supply Chain, DOI: 10.1109/AIBT57480.2023.00020

[20] Joanna Kane-Potaka1, Seetha Anitha1 *, Takuji W. Tsusaka2, Rosemary Botha3, Muralidhar Budumuru1, Shweta Upadhyay 4, Parkavi Kumar 1, Karuna Mallesh5, Raghavendra Hunasgi 6, Ashok Kumar Jalagam1 and Swamikannu Nedumaran1,7, Assessing Millets and Sorghum Consumption Behavior in Urban India: A Large-Scale Survey, Doi: 10.3389/fsufs.2021.680777