Comparative Study of *Mendol* as an Indonesian Traditional Side Dish in Food Tourism

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Efforts to stimulate economic growth, especially after the impact of the pandemic, are currently being undertaken worldwide. The tourism sector, a major economic driver, is transforming strategically. One promising strategy involves promoting traditional cuisine to enhance culinary tourism. Indonesian traditional dishes are an essential aspect of cultural heritage, and *mendol* is one of Indonesia's original signature dishes, particularly in Malang, East Java. This research aims to understand the highly sought-after combination of *mendol* dishes along with traditional Indonesian cuisine through Twitter data analysis. The study employs the Apriori algorithm to analyze the Twitter data's frequent item sets and association rules. The research findings reveal that *mendol* is a highly favored dish among Indonesian Twitter users, with *Rawon*, *Nasi Jagung*, and *Pecel* also receiving significant attention. The uniqueness of this research lies in the application of the Apriori theorem method to determine the most valuable culinary combinations within the framework of local culinary co-creation. This research provides insights that can be implemented to optimize culinary presentation, shape a distinctive image of local cuisine, and enhance the appeal of culinary tourism. Ultimately, this contribution is expected to positively impact economic growth.

I. Introduction

Struggles to stimulate economic growth are continuing in nearly every country as part of the economic recovery strategy due to the pandemic. Tourism is one of the major sectors expected to act as a driving force. In correlation to this, promoting traditional food is the right strategy for culinary tourism attraction. It requires taking the right steps in selecting traditional foods and side dishes with the potential for promotion. With these steps, culinary tourism promotion can be expected to realize the best results.

Based on the results of statistical analysis, tourists with a robust interest in local cuisine show the greatest appreciation for local food and form the group with the most significant economic impact in the region (Nicoletti et al., 2019). In their research, Alonso and Kok, (2021) highlight the potential of local gastronomy as a tool for socio-economic development. The tourism sector is very important for the growth of many countries. It impacts increasing economic income, creating thousands of job opportunities, improving national infrastructure, and establishing cultural exchange between foreigners and local residents (Chen & Guo, 2023).

In the last five years, much research has been carried out on the role of traditional foods as a part of promoting the growth of the tourism industry. The research results indicate that visitors are interested in the gastronomic aspect in addition to architectural richness, which together form a highly appreciated cultural product (Jiménez-Beltrán et al., 2019). Culinary has also become one of the superior products in tourism locations connected to local culture that is growing and developing (Niedbala et al., 2020). Including activities such as exploring culinary traditions in tourism experiences also has significant results for tourism development for businesses and governments. It

can improve the quality of tourism experiences and create unique selling points (Tiberghien et al., 2020). In other research, it was found that tourists mainly visit to enjoy local culinary delights, new experiences, and natural and cultural heritage (Topole et al., 2021).

Another research found that tourists motivated to travel because of food and beverages feel a stronger connection than other tourists in terms of travel experiences focused on food and drink to make experiences lasting memories (Stone et al., 2022). The research results of Thio et al. (2022) verify that culinary has a potential role in tourism as a development tool to promote destinations and improve the experience of tourists when they visit a tourist attraction.

According to previous research, providing traditional food is the right step as part of a culinary tourism attraction. By using the prestige of high-quality local food and restaurants serving typical local cuisine, tourism industry players can use new approaches to attract tourists to food (Hernandez-Rojas et al., 2021). Other research reveals how the act of negotiating and creating food experiences, co-created by tourists and suppliers, contributes to the evolution of a destination's foodscape (Park & Widyanta, 2022).

Mendol, as a highly distinctive type of side dish, is greatly favored as a companion to well-known traditional dishes such as *rawon*, *pecel*, *nasi jagung*, *soto*, *lalapan*, and others. However, the combination of *mendol* with which traditional food has the most support, as a representation of a highly sought-after side dish, has not been explored. The right combination can provide clear guidance to policymakers, making it a priority in crafting culinary tourism promotion. What makes this research interesting is the application of the Apriori theorem method to discover culinary combinations with the highest value within the co-creation framework in local cuisine. Therefore, the results of this research have significant implications for selecting optimal culinary presentations, shaping a distinctive image of local cuisine, and enhancing the appeal of culinary tourism. It is hoped that this can contribute positively to economic growth in Indonesia and provide an enticing culinary experience for tourists.

Mendol is a dish made from tempeh originating from Malang, East Java, Indonesia. This dish is widely recognized as a favorite among the local inhabitants. Tempeh is also reported to have potential human health benefits (Polanowska et al., 2020).

(A)   (B)

Fig. 1. Raw *Mendol* (A) Fried *Mendol* (B)

Mendol has an elongated shape with a brown color after frying, as seen in Figure 1, and it is served as a main dish or as a side dish to complement other meals. Unlike other *tempeh* dishes, *mendol* can be made from fresh or fermented tempeh, pungent-smelling, and dark-colored *tempeh* (Romulo & Surya, 2021). This recipe was initially created to prevent food waste by transforming fermented, spoiled *tempeh* into a food dish. The process of cooking *mendol tempeh* begins with preparing ingredients such as aromatic ginger (*kencur*), shallots, garlic, coriander, nuts, kaffir lime leaves, salt, and sugar. Traditionally, all these ingredients are finely ground and mixed together using a mortar and pestle until well combined. Afterward, all the ingredients are mixed with over-fermented tempeh until a soft dough is formed. This dough is then shaped and molded by hand into solid oval pieces. Depending on personal preference, the dough pieces can be stored at room temperature (30 ± 2 °C)

for 6 hours to allow fermentation and develop a tangier flavor. The cooking process involves frying the dough pieces in oil at a temperature of 170°C 170°C until they turn golden brown in color (Shurtleff & Aoyagi, 2011).

Combining *mendol* with traditional dishes brings a new perspective to the culinary experience. When *mendol*, with its unique texture and distinctive flavor, is paired with traditional dishes such as *rawon*, *pecel*, *nasi jagung*, *soto*, or *lalapan*, it creates an amazing harmony of flavors. The combination of *mendol* with the traditional dish *rawon* is shown in Figure 2.

Fig. 2. The Combination of *Mendol* with the Traditional Dish *Rawon*

This is guidance on how a simple dish like *mendol* can increase the deliciousness of famous traditional dishes. For most local residents, food is not even considered complete unless it is offered with this delightful *mendol*.

II. Method

This research uses Apriori theory to search for frequent itemsets using the Association Rule technique. Data was obtained by mining Twitter data using Python programming, with the addition of snscrape and pandas modules. The data preparation process uses Microsoft Excel. The data ready is then processed using the Orange Data Mining application.

Retrieving Twitter data, using the snscrape module which has been added to the list of python modules. The process of calling this module, by adding the import command, is placed at the beginning of the Python program (1). In the next line, a command is given to carry out data scraping on Twitter, with the query "*mendol enak*" (2), followed by repeated data retrieval commands, determined as many as 1,000 recent tweets (3), It is hoped that the results obtained will be sufficient to meet the needs for tweet data for the last five years.

import snscrape.modules.twitter as sntwitter	(1)
for i,tweet in enumerate(sntwitter.TwitterSearchScraper('mendol enak'). *get_items()):*	(2)
if i>1000:	(3)
break	

The data obtained is then saved into a .csv file, which contains tweet.date, tweet.url, tweet.content, tweet.user.location. This storage is done using the Pandas dataframe module. Calling this module is

done by giving the import module command (4) on the initial line after calling the snscrape module. The data is saved with the pd.DataFrame command, then continued with the tweets_save.to_csv command ('mendolEnak.csv') (5).

import pandas as pd (4)

tweets_save = pd.DataFrame(tweets_list2, columns=['Datetime', 'url', 'Text', 'location'])

tweets_save.to_csv('mendolEnak.csv', sep=';', index=False) (5)

Twitter data collection using a Python script was carried out on March 28 2023. The data collection script was carried out on the last 1,000 data, and then limited to data from 2019 to 2023, resulting in 650 remaining data. After cleaning, and selecting data that contained the word "*mendol enak*", as in Table 1, 566 data were obtained, the rest was data containing user names which had elements of the word *mendol*, so we didn't need them.

Table 1. Twitter Data Containing hhe Word "*Mendol Enak*"

Datetime	Url	Text	Location
2023-03-24 13:33:05+00:00	https://twitter.com/reveus oeur/status/16392590409 61404928	@esdoger3 @rotiawoka @FFOODFESS Btw mendol pedes trus ditepungin enak loh	
2023-03-24 11:59:46+00:00	https://twitter.com/kolom namadepan/status/16392 35553056133121	@raes_veeans Enak Tempe goreng, mendol, telur matasapi, sayur kelor bening.	Plat N. Malang Jawa Timur
2023-03-15 08:06:56+00:00	https://twitter.com/IinAg us92990234/status/16359 15471378866176	@MakNcip Enak dua dua nya inih mendol pake sambel petis enak, kalau akuðŸ˜ƒ	Karawan g Timur, Indonesia
2023-03-09 06:13:45+00:00	https://twitter.com/littled eeeer/status/1633712660 301877248	Urap urap, enak dimakan pake nasi putih/nasi jagung anget sama mendol/ikan asin/ikan pindang boleh tambahin sambel jangan lupa kerupuk hehehe ðŸ¤¤ðŸ¤¤ selamat makan siang	
2023-03-09 05:17:59+00:00	https://twitter.com/Candy tuffy/status/16336986256 99336194	@FOODFESS2 Aku suka mendol tempe. Dulu sering dibikinin sama almarhumah bulik ku tiap pulang ke bangil. Enak banget ðŸ¥º	Kota Surabaya , Jawa Timur
2023-03-09 04:22:39+00:00	https://twitter.com/haidia hs/status/1633684700110 929920	@FOODFESS2 Aku suka stok tempe di kulkas, kadang sengja aku asemin(busukin) buat dijadiin mendol tempe. Enak bgtðŸ¤¤	
2023-03-07 16:00:36+00:00	https://twitter.com/smtgis lowkey/status/163313557 0733121542	@FOOD_FESS Mendol!!!!!! Pleaseeeeee enak banget!! Olahan tempe khas jawa timur ini harus dicoba pairing sama sayur asem!	Jakarta Capital Region
2023-03-06 00:42:48+00:00	https://twitter.com/S2946 YR_Nj/status/163254221 1014524930	@FOOD_FESS Aku lebih suka lauknya mendol tempe ðŸ˜…. ikan asin plus sambel enak juga kak.	Jawa Timur, Indonesia
2023-03-03 01:26:22+00:00	https://twitter.com/steropi c/status/16314660077294 55106	proudly present to you âœ¨ mendol crispy. mau buat petisi untuk warga malang dan sekitarnya tolong untuk distribusi tempe kualitas tinggi ke jakarta karena susah bgt cari tempe enak di jkt https://t.co/RUv9FV41q7	

To determine the right traditional food target combined with mendol side dishes, tokenize the Twitter data obtained, and get wordcloud visualization results as in Figure 3. From these results, traditional foods that are widely referred to with the word *mendol*, are: *rawon*, *nasi jagung*, *pecel*, *soto*, *sambel*, *lodeh*, and others. From these results, 4 keywords other than *mendol* were selected, for further analysis.

Fig. 3.Wordcloud of Tweet Text without *Mendol*

The data obtained were then selected again only on data that also contained the words *rawon*, *nasi jagung*, *pecel* or *soto* obtained as many as 106 data that were ready to be processed, as in Table 2.

Table 2. Twitter Data that has been Selected and Contains Certain Words

Datetime	Text	Location
2023-03-02 08:58:50+00:00	kalau rawon mungkin enak ya tapi kalau sama mendol	-
2023-01-07 09:33:25+00:00	tergantung sego pecel bisa mendol tempe plus sambel yo enak rawon atau soto boleh juga rujak vindravan yo gak popo bu pokok doyan di ajak maju kok malah mundur sampeyan	-
2022-12-26 02:18:10+00:00	enak nasi jagung urap mendol ikan asin orem kak	Indonesia
2022-12-23 06:05:13+00:00	mendol terbuat dari tempe yang diremet atau dihancurkan dengan tangan ini rasanya gurih dengan aroma wangi daun jeruk seng enak yo mendol tekan tempe 2 harian sih rada keciinggg dimakan dengan pecel atau rawon dijamin fokus	-

Twitter data is only taken from the Text section and all words are deleted except for the predetermined words: *rawon*, jagung, *pecel*, soto. The data is then saved using the Excel application and each word is separated in columns, as in Table 3.

Table 3. Parsed Data in Excel

1	2	3	4
mendol	soto		
mendol	rawon	soto	
mendol	rawon	pecel	
mendol	rawon	pecel	soto
mendol	rawon	pecel	jagung
mendol	rawon	jagung	soto

The table is stored in an excel file, then processed with orange data mining as in Figure 4.
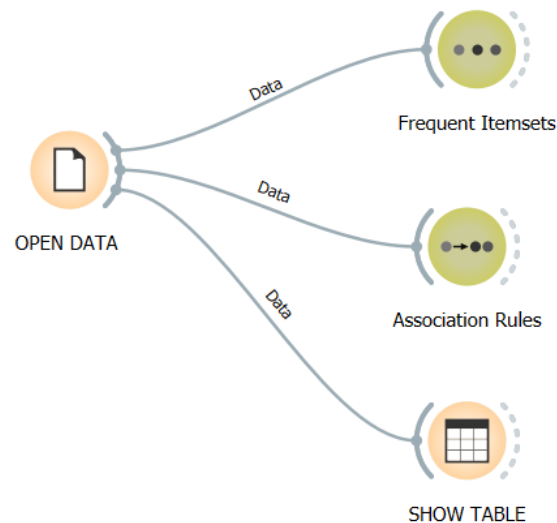
Fig. 4. Process in Orange Data Mining

Data in the excel file, opened with a file widget, which is then named OPEN DATA, also added 4 widgets, including Frequent Itemsets, Association Rules, Predictions, and Table. Data that has been opened, can be seen through the table widget as shown in Figure 5.

Fig. 5. Table Widget View

III. Results and Discussion

In the Frequent Itemsets widget as in Figure 6, a minimum support of 50% is specified, and the results are displayed Itemsets, Support, and percentage. As a result of the Itemsets table, it can be seen that the most frequently appearing itemsets are mendol and rawon. It shows that half of the Twitter tweet data processed, contains the words *mendol* and *rawon*. Likewise, *mendol* and *rawon* have a strong relationship and are often a choice together.
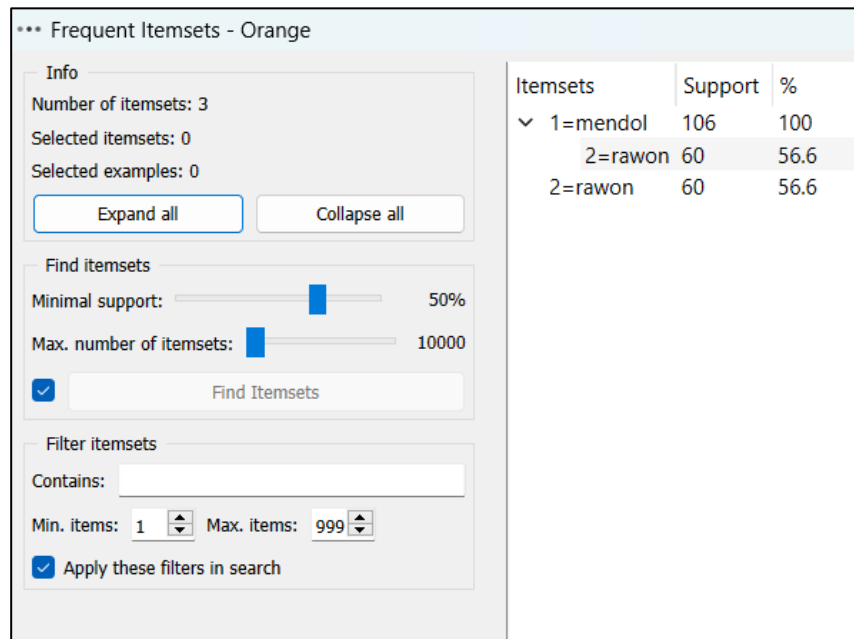
Fig. 6. Frequent Itemsets View

The *rawon* itemset has a support of 56%. Other options that also have a strong relationship as in Figure 7 are *nasi jagung* with *mendol* at 26.4% as well as *pecel* with *mendol* at 12.3%. The choice of *soto* with *mendol* has support of 0.4%.
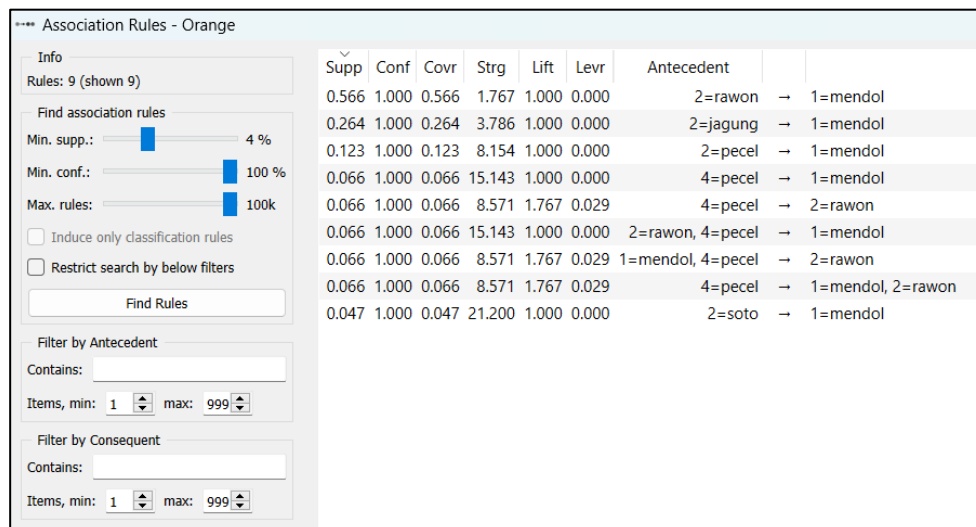

Fig. 7. Association Rules View

IV. Conclusion

The combination of *mendol* and *rawon*, which received the greatest support by 56%, was recognized as the most optimal. The results of this study show the importance of promoting *mendol*, a typical dish of Malang, as the main attraction in Indonesian culinary tourism. The important role of *rawon* itemset in the composition of food should also be noted. The study used an "A priori theory" approach, which can be used to investigate other food combinations that have a strong relationship with each other. For example, *nasi jagung* with *mendol*, which gets about 26.4% support, and *pecel* with *mendol*, which gets about 12.3% support, are attractive alternatives to developing interesting culinary menus. Although support for the choice of soto with *mendol* is lower which is only around 0.4%, this study opens up opportunities to explore the potential for future innovation. In addition, the

mendol industry must consider opportunities in the development of modern packaging. It plays an important role in maintaining product quality and expanding market reach. *Mendol's* development and innovation in Malang's culinary industry can make a significant positive contribution if done with the right promotional strategy and exploring food combinations that have a strong relationship.

The suggestion for future research is to look for other traditional food combinations, which can be combined with traditional side dishes from several regions in Indonesia. With this research, it can be expected to increase the treasures of traditional food and help the development of culinary tourism, thus having an impact on the movement of the nation's economy.

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