Monasdir et al./Animal Production. 25 (3): 199-208, 2023
Accredited by Kemendikbudristek Dirjendiktiristek No 225/E/KPT/2022. E-ISSN 2541-5875

Characteristics of Dried Yoghurt and Market test on adolescent consumers, adults and employees in Bogor City

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Abstract. This study aimed to analyze the characteristics of dried yogurt, market potential, consumer perception, consumer purchasing behavior, and attributes that affect the purchase of dried yogurt by teenagers, adults, and employees in Bogor City. The dried yoghurt was made by sterilizing it using an autoclave at a temperature of 115 ℃ for 3 minutes then cooling it to 40-45 ℃. The bacterial inoculation was carried out with L. Plantarum IIA-1A5, followed by adding rosella flower extraction. Before drying the yougurt with a spray dryer, maltodextrin and skim milk were added. Characteristics testing and market testing of dried yogurt were then carried out. The results showed that, based on testing the characteristics of dried yogurt with parameters of water content, pH, Aw, viscosity, TAT, and total lactic acid bacteria, dried yogurt is safe for consumption. Based on the results of the conjoint analysis, it shows that to market dried yoghurt, producers must design dried yoghurt with probiotic content, and then the product packaging must be in accordance with consumer tastes. In this case, consumers prefer dried yoghurt with a packaging of 7 grams and priced at 10.000. Based on the results of the discriminant analysis, it shows that out of 100 respondents, as many as 90 people will buy dried yogurt if dried yogurt is marketed. Then 4 people will not buy dried yogurt if it is marketed, and 6 people are hesitant about the choice. Based on the descriptive results of the study, it was shown that out of 100 respondents, there were 47 women and 53 men with large families totaling 4 people, with an average income and expenditure per month of Rp. 500.000–Rp. 1.500.000.

Keywords: Dried Yoghurt, Consumer, Conjoint analysis, Decriminant Analysis, Marketed

Abstrak. Penelitian ini bertujuan untuk menganalisis karakteristik yoghurt kering, potensi pasar, persepsi konsumen, perilaku pembelian konsumen, dan atribut yang mempengaruhi pembelian yoghurt kering pada remaja, dewasa dan karyawan di Kota Bogor. Yoghurt kering dibuat dengan cara disterilkan menggunakan autoclave pada suhu 115 ℃ selama 3 menit kemudian didinginkan pada suhu 40-45 ℃. Inokulasi bakteri dilakukan dengan L. Plantarum IIA-1A5, dilanjutkan dengan penambahan ekstrak bunga rosella. Sebelum mengeringkan yogurt dengan pengering semprot, ditambahkan maltodekstrin dan susu skim. Selanjutnya dilakukan pengujian karakteristik dan pengujian pasar terhadap yoghurt kering. Hasil penelitian menunjukkan bahwa berdasarkan pengujian karakteristik yoghurt kering dengan parameter kadar air, pH, Aw, Viskositas, TAT dan total bakteri asam laktat yoghurt kering aman untuk dikonsumsi. Berdasarkan hasil analisis konjoint menunjukkan bahwa untuk memasarkan yoghurt kering, produsen harus merancang yoghurt kering dengan kandungan probiotik, maka kemasan produk harus sesuai dengan selera konsumen, dalam hal ini konsumen lebih memilih yoghurt kering dengan kemasan 7 gram dan dihargai 10.000. Berdasarkan hasil analisis dekriminan, menunjukkan bahwa dari 100 responden, sebanyak 90 orang akan membeli yoghurt kering jika yoghurt kering dipasarkan. Maka 4 orang tidak akan membeli yogurt kering jika dipasarkan dan 6 orang ragu dengan pilihannya. Berdasarkan hasil deskriptif penelitian menunjukkan bahwa dari 100 responden terdapat 47 perempuan dan 53 laki-laki dengan keluarga besar berjumlah 4 orang, dengan rata-rata pemasukan dan pengeluaran sebulan sebesar Rp. 500.000 – Rp. 1.500.000.

Kata kunci: Yoghurt Kering, Konsumen, Analisis konjoint, Analisis Dekriminan, Pasar

Introduction

Dried yogurt is one of the innovations in yogurt product development. Dry yogurt can increase the shelf life of yogurt and is more practical because it reduces volume, making the distribution process easier (Herminiati et al. 2015). Spray drying is a well-established technique to quickly dry large amounts of liquid into a fine powder while remaining soft enough for use with heat-sensitive compounds (Bates, Morris, & Crandall, 2001). As for the drying method, it uses spray drying. Spray drying is one of the microencapsulation techniques that is widely used and recommended because it is able to evaporate water quickly at high temperatures

and pressures. Processing yoghurt in the form of dried yogurt is one of the alternatives that can be chosen to maintain the quality of yoghurt. Yogurt in dry or powdered form can last longer and simplify the distribution process. In addition, the water content of dry yogurt is lower, so it is not easily contaminated by other microbes.

Dried yogurt is more widely circulated abroad than within the country itself, and generally abroad it is well known. So a market test is needed to see how the characteristics of dried yoghurt, market potential, consumer perception, consumer response (response) to dried yoghurt, consumer purchase behavior, and attributes that affect dried yoghurt purchasing are made by teenagers, adults, and employees in Bogor City. Bogor City is one of the cities in West Java whose milk consumption level tends to increase along with the increase in community welfare and increased public nutrition awareness (Cahyanti 2016). Bogor is one of the potential cities for marketing fermented milk products, namely yogurt. There are several yogurts marketed in the city of Bogor, including Cimory, Yofit, Biokul, Heavenly Blush, Mella, G-Yoru, and Suboo. The large selection of yogurt available on the market will make consumers more selective in determining product choices that suit their needs and desires, so producers need to know the behavior of teenagers, adults, and employees in Bogor City. This study aims to analyze the characteristics of dried yogurt, market potential, consumer perceptions, consumer purchasing behavior, and attributes that affect the purchase of dried yogurt by adolescent consumers, adults, and employees in Bogor City.

Materials and Methods

The approach for market testing in this study involves a method for choosing individuals from the population to serve as a representative sample. The population under study is situated in Bogor City, with data indicating a total of 1,064,687 consumers in Bogor City (BPS 2016). The sample size for the study was determined using the Slovin formula, which allowed for a 10% margin of error, resulting in a sample of 100 individuals.

The method of making dried yogurt involves starting with packaged milk sterilized using an autoclave at 115 °C for 3 minutes, then cooling to 40–45 °C. Next is the inoculation of L. Plantarum IIA-1A5 bacteria into milk, followed by the incubation in an incubator at a temperature of 37 °C for 18–20 hours. Then the extraction of rosella flowers is carried out by adding aquadest to dried rosella petals as much as 20 grams per 1000 ml (b/v) or as much as 2%, then boiling to a temperature of 100 °C, then lowering to 60 °C. Extracting rosella flowers was done for 30 minutes at 60 °C, then steeping water was filtered to separate the dried rosella and extract. Next, add rosella extract in a ratio of 1:1 to the volume of milk. Before drying into powder using a spray dryer, yogurt is first fermented with milk, and rosella yogurt is homogenized with maltodextrin and skim milk powder. Once homogeneous, drying is then carried out using a spray dryer by first setting the inlet temperature to 130–140 °C and the outlet temperature to 70–80 °C. Then look at the Brix yogurt, which has a density of 21%. Inlet temperature greatly affects the viability of the lactic acid bacteria L. plantarum 1A5. The time needed for 50 liters of rosella yogurt to become powder is about 1-2 hours.

The sample used to determine the characteristics of dried yogurt is dried yogurt. The variables observed in this study were moisture content and oven method. The measurement of moisture content (SNI 01-2891-1995) is carried out by the ordinary oven method. A total of 3 grams of sample is put into an aluminum dish that has a known weight, then dried in the oven at 105 °C, then cooled using a desiccator. Weigh and repeat drying until a fixed weight is obtained. pH measurement, according to AOAC (2005), is the pH value of dried yogurt measured using a pH meter. The first step is the

calibration of the pH meter, which is carried out with pH buffers 4 and 7. The sample is prepared sufficiently, approximately until the tip of the pH meter is submerged (electrode pH meter). The pH value is recorded when the pH meter shows a stable number and a smile sign appears. Measurement of water activity according to Meilanie et al. (2008) This measurement uses an aw meter with the brand Novasina (Switzerland). The tool is turned on by pressing the start button. Wait for the temperature indicated on the appliance to be below 30 °C. The dried yogurt sample is inserted in the chamber, then press the start button again and wait until the aw value appears. According to Wibawanti and Rinawidiastuti (2008), Viscosity testing of dried yogurt is measured using a viscometer. The first step of the reconstituted sample was to prepare as much as 150 mL of sterile aquadest water and 15 packets of dried yogurt, each containing 7 grams, and then to put them in a glass vessel container. Install the spindle and turn on the tool. The spindle is dipped in a glass vessel that already contains a sample and then tested with the viscometer. Total Titrated Acid Testing, according to AOAC (2005), starts with samples of yogurt powder weighing 7 g being added to 15 mL of aquadest. After that, 2 drops of phenolphthalein (pp) indicator were added and titrated with a 0.1 N NaOH solution until a pink color was formed. Total Lactic Acid Bacteria Testing, according to BSN (2009), is done by taking yogurt samples as much as 1 mL, then putting them into a test tube containing a sterile BPW solution of 9 mL, closing it, and homogenizing it using a rotary vortex. The dilution is graded until the seventh dilution by taking 1 mL of suspension and adding it to a second test tube with the same amount of BPW. The suspension is 1 mL in the fifth, sixth, and seventh tubes, then inserted in a duplo into a sterile petri dish. Sterile MRSA that has been cooled to a temperature of ±45 °C, as much as 15-20 mL, is then inserted in a petri dish and moved to form a figure eight for the distribution of lactic acid bacteria cells evenly. The dish containing the media and sample is cooled to harden and incubated in an incubator at 37 °C with the cup upside down for 36–48 hours. The number of growing colonies is calculated using colony counters. Test the market to see the market potential, preference for the product, and scale of importance for the purchase of the product. The market test discussed is how a person's habits in purchasing a product can be influenced by the knowledge they have and the influence of the environment on efforts to maintain a healthy body. Respondents consisted of teenagers, adults, and employees in the city of Bogor.

Data analysis of dried yogurt and yogurt powder attributes was performed with multivariant marketing analysis. The multivariant analysis used was conjoint analysis, while the marketing multivariant analysis used to see respondents responses in Bogor city to dried yogurt or yogurt powder was discriminant analysis. Discriminant analysis was performed using Product and Service Solutions (SPSS) Statistics 24 software. Meanwhile, the data obtained from testing the characteristics of dried yogurt, namely physicochemical and pH test data, were analyzed using a descriptive method. Conjoint analysis was performed using the Statistical Analysis Software (SAS) 9.

Conjoint analysis model :

$$U = b0 + b1X1 + b2X2 + b3X3$$

Where :

U = conjoint score

X1 = represents weight

b = discriminant coefficient or weight

X2 = represents nutrition

X = Predictor or Variable Independent

X3 = represents price

A discriminant analysis model is an equation that shows a linear combination of various independent variables, namely:

Table 1. Characteristics of dried yoghurt

Parameter	Dried yoghurt
Water content (%)	6.20±0.14
pH	4.46±0.01
Water activity (Aw)	0.37±0.06
Viscosity (dPa)	3.33±0.15
Total acid titration (%)	0.31±0.07
Total lactic acid bacteria	10^8±1.06

*Source: Saraswanti Laboratory Testing and Technology of livestock products

$$D = b0 + b1X1 + b2X2 + b3X3$$

Where :

D = discriminant score b = discriminant coefficient or weight

X = predictor or independent variable

X1 = If dried yogurt products are produced and available on the market will you buy at that place?

X2 = If there is a new yoghurt product/dried yoghurt would you try it?

X3 = Have you ever heard of dried yoghurt?

Results and Discussion

Powdered yogurt is a product of fermented milk, which is then further processed through a drying process so that it has a longer shelf life and is easier to distribute. However, even though it has gone through the drying process of the starter, the bacteria used are still in living conditions or can survive the drying process of the spray dryer. Dried yogurt is formulated for a longer shelf life and easy distribution. Dried yogurt can be stored at room temperature and freezer temperature. Testing the characteristics of dried yogurt is important to do because it will determine the quality of dried yogurt and the safety of dried yogurt products. Characteristics of dried yogurt are listed in Table 1.

Water content

Based on the above characteristics, the moisture content parameter obtained a dried yogurt moisture content of 6.20. According to Winarno (2008), powder products that have a moisture content of 3%–7% will be resistant if stored for a long time. Moisture content of less than 7% in *Lactobacillus rhamnosus* microencapsulated using a spray dryer with different carrier materials can minimize damage and loss of bacterial viability during storage (Ananta et al. 2005). Then the moisture content of the dried yogurt can also be influenced by the inlet temperature and outlet temperature during the drying process using a spray dryer. The inlet temperature used is 130–140 °C, and the outlet temperature is 70–80 °C. According to Koc et al. (2010), at an outlet temperature (exit temperature) of 60 °C and an inlet temperature (inlet temperature) of 165 °C, a maximum moisture content of 7.17 is obtained. So based on this, the outlet temperature or the temperature of the outgoing air affects the water content that will be produced. The higher the outlet temperature, the lower the water content that will be produced.

The Value of pH

The pH value of 4.46 can be influenced by the formation of lactic acid, as argued by Nadia et al. (2020). The decrease or increase in pH value is influenced by the formation of lactic acid as an activity of lactic acid. The pH value of dried yogurt produced is still in accordance with SNI standards (2009); the quality requirement of good yogurt has a pH value of around 3.80–4.50. So based on this, dried yogurt is safe for consumption.

The Value of Aw

The value of water activity is closely related to the water content of foodstuffs, which affects their shelf life (Belitz et al. 2009). The Aw value obtained in this study is 0.37, which indicates that drying affects the Aw value and will increase

the shelf life. Water activity owned by foodstuffs ranges from 0 to 1 (Leviana and Paramita, 2017). According to Widodo et al. (2012), full milk powder with an Aw content of 0.3 has a shelf life of 0.5 to 2 years. So based on this, with a moisture content of 0.37, dried yogurt has a shelf life of 0.5 to 1 year.

Viscosity

Viscosity is an obstacle that holds a liquid substance moleculeally due to the random movement possessed by the liquid substance (Susanto & Yuwono 2001). The viscosity value of dried yogurt in this study was 3.33 dpa. The viscosity of dried yogurt is higher than the viscosity of yogurt with rosella extract, which is at a value of 2.16-3.13 dPa (Oktaviana et al. 2018). This can be influenced by the stirring factor during the dried yogurt reconstitution process. According to Chairunnisa et al. (2017), yogurt will experience changes in texture and viscosity if, after incubation, the stirring process is carried out.

Total acid titration

TAT value of 0.3%. According to Oktaviana et al. (2018), the TAT value in yogurt is one of the acidity indicators, which is generally inversely proportional to the pH value. The percentage of TAT value of dried yogurt is still in accordance with the standard value of SNI Mutu yogurt (BSN 2009), which is 0.5%–2.0%. Meanwhile, according to Rosiana et al. (2013), The increase in TAT is influenced by lactic acid levels and the activity of bacteria that convert lactose into lactic acid during the fermentation process. The measurement of Total Calculated Acid (TAT) is the determination of the total concentration of acid contained in a food ingredient (Kamaluddin and Handayani 2018). The results showed that, based on testing the characteristics of dried yogurt with parameters of water content, pH, Aw, viscosity, TAT, and total lactic acid bacteria, dried yogurt is safe for consumption.

Total Bacteria lactic acid

LAB dried yoghurt after the spray dryer process obtained a total of lactic acid bacteria of 10^8 The minimum requirement for total lactic acid yogurt bacteria according to SNI 2981:2009 (BSN 2009) is 7 logs cfu/ml, or 10^7, so that dried yogurt products are above the specified SNI standard. Badel et al. (2011) state a good yogurt product contains a minimum standard of lactic acid bacteria of 10^7 cfu/ml per product. The higher the nutritional content in milk, especially the lactose content, the more lactic acid bacteria that can grow (Agustine et al. 2018).

General characteristics of the respondent

The characteristics observed in this study included gender, age, education level, type of work, average monthly income, average monthly expenses, number of family members, and frequency of yogurt purchases. Each of these respondents is in Table 2, 3 and 4.

As it's shown on Table 2, most of the respondents were men, namely 53 men and 47 women. Then the age of respondents was divided into 5 classes, namely 13–18 years, 19–25 years, 26–30 years, 31–35 years, and >35 years. Respondents aged 13–18 were as many as 40 people, which is dominated by respondents located at SMA Negeri 1 Bogor. Then the location at the livestock research and development centre of respondents aged 26–30 years was as many as 4 people; respondents aged 19–25 years were as many as 3 people; respondents aged 31–35 years were as many as 1 person; and respondents aged >35 years were as many as 12 people. Then the respondents at Dramaga Bogor Agricultural University were aged 19–25 years, as many as 38 people, and aged 26–30 years, as many as 2 people. The results showed that the majority of dried yogurt respondents were men, with jobs as students, with the last education in junior high school or equivalent, with an average income and expenditure per month of Rp. 500,000–Rp. 1,500,000.

Table 2. Characteristics of respondents dried yoghurt

Characteristic of respondent	Description	Percentage(%)
Gender	Male	53
	Female	47
Age	13-18 years old	40
	19-25 years old	41
	26-30 years old	6
	31-35 years old	1
	> 35 years old	12
Recent education	Junior high school/equivalent	40
	Senior high school/equivalent	19
	Diploma	1
	S1	40
Occupation	Student/ student	80
	Civil servant	15
	Honorary employees	5
	Housewives	0
Monthly income/pocket money	< Rp 500,000	23
	Rp 500,000 - Rp 1,500,000	35
	Rp 1,500,000 - Rp 2,500,000	15
	Rp 2,500,000 - Rp 3,500,000	7
	Rp 3,500,000 – Rp 4,500,000	9
	>Rp 4,500,000	11
Monthly average expenses	< Rp 500,000	25
	Rp 500,000 - Rp 1,500,000	40
	Rp 1,500,000 - Rp 2,500,000	12
	Rp 2,500,000 - Rp 3,500,000	10
	Rp 3,500,000 – Rp 4,500,000	11
	>Rp 4,500,000	2

[a]Source : Primary data processed (2023

Based on Table 3, it can be seen that the majority of respondents have a family of 4 people, compared to 38 respondents. The second-highest number with 5 family members was 22 respondents. Then came the third highest number, with 3 family members and as many as 16 respondents. The majority of respondents have families, so this has great potential for marketing dried yogurt.

Table 3 Diversity of respondents by number of family members

Location	Number of family number										Total
	1	2	3	4	5	6	7	8	9	10	
Public high school 1 Bogor (Teens)	0	0	5	14	10	7	2	1	0	1	40
Puslitbangnak Bogor (employees)	0	1	9	6	3	0	1	0	0	0	20
IPB Dramaga Campus (Adults)	0	1	2	18	9	8	1	1	0	0	40
Total	0	2	16	38	22	15	4	2	0	1	100

[a]Source : Primary data processed (2023)

Table 4 Diversity based on the frequency with which yoghurt is purchased

Location	Purchasing Frequency						Total
	1 time a day	1 time a week	2-3 time a week	Once a month	a month 2 times	>a month 2 times	
Public high school 1 Bogor (Teens)	1	14	12	11	1	1	40
Puslitbangnak Bogor (employees)	0	12	1	4	3	0	20
IPB Dramaga Campus (Adults)	0	11	6	12	11	0	40
Total	1	37	19	27	15	1	100

[a]Source : Primary data processed (2023)

The frequency of yogurt purchases in Table 4 made by respondents varies greatly, from the purchase of yogurt made by respondents every day to buying liquid cooking oil more than once a month. Respondents generally bought yogurt once a week, totalling 37 people. Respondents who bought yogurt once a month were as many as 27 people; respondents who bought yogurt two to three times a week were as many as 19 people.

Consumer Preference for Dried Yoghurt Attributes

Consumer preferences towards dried yogurt attributes were analyzed using a conjoin analysis tool using SPSS 24 for Windows. The results of the conjoint analysis explain the relative importance value, which shows which attributes are most important in influencing consumers to buy dried yogurt. Based on the results of the conjoint analysis, of the three used in this study, the results have a level of importance as shown in Table 5 below.

Based on the results of the research on the relative importance value of dried yoghurt attributes, it can be concluded that the dried yoghurt attribute that is considered the most important by consumers is nutrition with an interest value of 47,037, the next is the weight attribute with an importance value of 23,061, and the last is the price attribute with an importance value of 29,902. According to Engel, Blackwell, and Miniard (1995), there are three important attributes that are commonly used for evaluation: the price, the brand, and the product maker. The price is an attribute of products and services that is most often used by most consumers to evaluate a product. This is also in the opinion of Sumarwan (2002) which state consumers in Indonesia still mostly have low incomes; therefore, the price is the main factor considered when choosing a product or service.

Table 5 The relative importance value of dried yoghurt attribute

Attributes of dried yoghurt	Importance values
Weight	23.061
Nutrition	47.037
Price	29.902

[a]Source : Primary data processed (2023)

Table 6 Results of discriminant analysis

Classification Result[a,c]					
			Predicted Group Membership		
		Y	No	Yes	Total
Original	Count	No	4	1	5
		Yes	5	90	95
	%	No	80	20	100
		Yes	5.3	94.7	100
Cross-validated[b]	Count	No	4	1	5
		Yes	5	90	95
	%	No	80	20	100
		Yes	5.3	94.7	100

[a]Source: Primary data processed (2023)

Discriminant Analysis

The results of the discriminant analysis are used to predict if dried yogurt is produced and whether consumers will buy this dried yogurt product in the market. The result of the discriminant analysis is presented in Table 6.

The results of the discriminant analysis showed that out of a hundred respondents, as many as ninety people would buy dried yogurt if dried yogurt was marketed. Then four people will not buy dried yogurt if it is marketed, and six people are hesitant about the choice. Discriminant analysis model can be illustrated as Y = -12,219 + 1,461 X1 - 4,376 X2 + 846 X3.

Conjoint analysis

Conjoint analysis is very useful to see what attributes affect the purchase of dried yogurt by consumers. The results of the conjoint analysis are presented in Table 7.

Table 7 Results of conjoint analysis

Variable		Utility Estimate	Std. Error
Weight	7 gram	.416	.341
	10 gram	-.155	.341
	15 gram	.270	.341
	20 gram	-.389	.341
	30 gram	-.127	.341
Nutrition	Enriched probiotics	1.076	.341
	Unenriched probiotics	-1.045	.341
Price	10.000	1.021	.341
	15.000	.076	.341
	20.000	.016	.341
	30.000	-.118	.341
	45.000	.050	.341
	8.000	-.332	.341
	13.000	-.152	.341
	18.000	-.094	.341
	26.000	-.467	.341
(Constant)		4.983	.121

[a]Source : Primary data processed (2023)

Based on the results of the conjoint analysis, consumers like dried yogurt enriched with probiotics weighing 7 grams, and the price of dried yogurt is Rp. 10,000. The utility estimate is to find out the average respondent's liking for an attribute. A utility is a value that represents the utility of each attribute or level. If the utility graph is positive, then it means that the respondent likes the attribute. Based on the utility estimate, it shows that a weight of 7 grams is most preferred with a utility estimate of 416, and then consumer nutritional attributes prefer to be enriched with probiotics with a utility estimate of 1,076. The most preferred price attribute for adolescent, adult, and employee consumers is the price of Rp.10,000 with a utility estimate of 1,021. According to Santoso (2004), conjoint analysis is used to help obtain or compose the attributes of a product, both new and old, that consumers like the most. The main result of conjoining is the form (design) of a product of goods or services or a certain object desired by most respondents. In the process, conjoint analysis will provide a quantitative measure of the level of utility and relative importance of an attribute of the product (Hair et al., 1998).

Conclusions

Dried yogurt is safe for consumption based on its characteristics and has the potential to be marketed in Bogor City because many teenagers, adults, and employees are health-conscious. Based on product evaluation using conjoint analysis, the underlying reason for consumers to buy dried yogurt is the probiotic content, followed by the affordable price and weight of the product. The majority of respondents liked dried yogurt products with 7 grams of packaging with probiotic content and a price of Rp.10,000. Marketing recommendations for dried yogurt include producing dried yogurt according to consumer tastes, namely dried yogurt with probiotic content, affordable prices, more product weight, and attractive packaging.

Acknowledgement

Thank you to the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) of the Republic of Indonesia through the Kedaireka 2022 Matching Fund Program No. SPK.15378/IT3.L2/HK.07.00/P/T/2022 which has funded this research to completion. Thank you to CV. Sari Burton for being a partner in this research.

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