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Effect of different oils and sugar syrups on the properties of tray kadayif (traditional Turkish dessert)

Burak Başar^{1,2*}  and Hüseyin Boz¹

Abstract

The aim of this study was to analyze the effect of different oils and sugar syrups on the sensory and textural properties of traditional Turkish dessert the tray kadayif. The textural parameters of the tray kadayif samples were significantly ($P < 0.01$) affected by the replacement of sunflower oil and hazelnut oil with butter. The cutting hardness values of the tray kadayif samples increased with the increase in the amount of sunflower oil added to the formulations. The highest hardness values were achieved in formulations without butter in terms of both cutting hardness and fork hardness. The stickiness values reached the highest level in formulations containing 50% sunflower oil, 50% butter and 0% hazelnut oil. When the sugar syrups were compared, the stickiness values of the samples with sucrose syrup were found to be higher than the samples with glucose syrup. As a result of the sensory analysis conducted, though all the formulations were accepted by panelists, the highest score from the panelists was received by the formulations containing 75% butter and 25% oil (sunflower and hazelnut oil). It was also determined that the tray kadayif samples prepared with sucrose syrup had higher scores than the samples prepared with glucose syrup in terms of sensory properties.

Keywords Kadayif, Sunflower oil, Hazelnut oil, Glucose syrup

Introduction

Turkish cuisine includes a wide variety of foods, especially pastries. Turkish cuisine, which is among the richest cuisines in the world, is one of the three main cuisines along with Chinese and French cuisines. Undoubtedly, the richness of Turkish culture stems from the ancient history of the Turks. In addition, since the Turks migrated in large numbers from the past to the present, it has turned into a rich culinary culture synthesized as a result of interaction with different cultures [1].

Kadayif has a very large place in Turkish cuisine. Desserts with kadayif were encountered in Turkish cuisine during the Seljuk period and have reached the present day without losing their importance. Although the preferences in different regions have changed, it has always continued to preserve its place in the Turkish culinary culture by diversifying with hazelnut, walnut and pistachio [2]. Kadayif served with the meals served to the guests during the ceremonies held during the Seljuk period is among the prominent desserts [3].

It shows that kadayif was among the preferences of the Sultans from the records in the kitchen notebooks called “Beray Hassa,” where kadayif was also included in the list of dishes given in the soup kitchens during the Anatolian Principalities. From this information, it is understood that the history of kadayif dates back to ancient times [4]. Kadayif varieties are also described in the cookbook

*Correspondence:

Burak Başar
burak.basar@atauni.edu.tr

¹ Gastronomy and Culinary Arts Department, Tourism Faculty, Atatürk University, <https://avesis.atauni.edu.tr/burak.basar>

² Gastronomy and Culinary Arts Department, Tourism Faculty, Atatürk University, <https://avesis.atauni.edu.tr/huseyinboz>



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Melceü't-Tabbâhin, which was first published in Turkish during the Ottoman period. In the sixth part of this book, which consists of 12 chapters, in the section (sixth chapter—Pastry desserts) the types of kadayif cooked in the period are mentioned; there are recipes for palace wire kadayif, bread kadayif, lean kadayif, yufka kadayif and fodula kadayif [5]. Although the type of meals served during Ramadan, weddings and other celebrations and banquets during the Ottoman Empire varies depending on the season, baklava, lokma, kadayif and milk desserts are among the most popular desserts [6]. Turkish cuisine has been influenced by all geographies where Turks live and has also affected these geographies. Kadayif, which is consumed as a dessert in the Balkans, Turkey and the Middle East today (Fig. 1), is one of the most delicious varieties of Turkish desserts [7], and there are varieties prepared with different ingredients and cooking techniques. Dolma kadayif, burma kadayif, künefe and tray kadayif are among the traditional dessert varieties produced using tel kadayif [8, 9].

Tel kadayif is a semi-processed product prepared by adding wheat flour to drinking water, and it is made by pouring dough on a plate to bake [7, 10–13]. Tray kadayif is one of the important traditional dessert varieties belonging to the Turkish cuisine which can be served hot or cold depending on demand, which is produced using tel kadayif and walnut. It is made from tel kadayif served in almost all restaurants in Turkey, and the history of these desserts goes back hundreds of years. Different oils,

walnut, hazelnut and various sugar syrups can be used in the production of tray kadayif.

Traditional foods include healthy foods that have social and cultural value and preference, are accessible, are prepared using local natural ingredients and are unique to a region or country [14–18]. Eating habits and traditional foods are among the most important clues about the way and manner of life of the societies and are also part of the cultural heritage. Prevention of loss of traditional products, the maintenance of traditional eating habits and their transfer to future generations are extremely important in terms of human health [19]. Local and traditional flavors should be given importance in order to protect kitchen cultures, to increase food variety and to enable people to be fed healthier.

Particularly, the use of liquid oils instead of butter and glucose syrup instead of sucrose syrup is becoming widespread in the production of tray kadayif with the aim of reducing production costs. As is known, consumers can only make sensory evaluations about the products they bought. The purpose of this objective study was to determine the effect of different oils and sugar syrups on physical, sensorial and textural properties of the tray kadayif.

Materials and methods

Tel kadayif, sunflower oil, hazelnut oil, butter, sucrose and glucose syrups used in the study were purchased from the local market (Erzurum, Turkey). The tel kadayif containing 23% moisture, glucose syrup containing



Fig. 1 Map showing the geographical regions where kadayif dessert is widely consumed. <https://www.mapchart.net/world.html>

78°brix and 65 dextrose equivalent (DE: 65) was used in the tray kadayif production. Sucrose and glucose syrups were used by converting to 50°briks degrees.

Tray kadayif production

Five hundred grams of the tel kadayif (Fig. 2) and 200 g of oil were blended by hand to make a homogenous mixture. Butter was used in the production of the tray kadayif (control), and the sunflower and hazelnut oil included in the formulations was subtracted from the amount of butter. The mixture of oil and wire kadayif was placed in a metal baking tray and pressed for 20 min with 10 kg weight before baking. After pressing, the trays (INOK-SAN FKG 042E) were baked in a convection oven at 180° for 50 min and 600 ml cold sugar syrup (sucrose and glucose) was added, while the tray kadayif was hot.

Color measurement

The Minolta colorimeter CR-200 (Minolta Camera Co., Osaka, Japan) was used to determine the color intensity of the samples, and measurements were taken at five different points on each sample surface. The results were expressed as Hunter L (whiteness/darkness), a (red/green) and b (yellow/blue) values [20].

Texture analysis

Hardness of the tray kadayif samples (5×8 cm dimensions) was measured using a texture analyzer (TA-XT2i, Stable Micro Systems, UK) in a compression mode with a sharp blade-cutting probe. Pre-test, test and post-test speeds were 1.5, 2 and 10 mm/s, respectively. Hardness was measured as maximum peak force. Test parameters are as follows: the pre-test speed was set to 1 mm s⁻¹,

the test speed to 3 mm s⁻¹, the post-test speed to 4 mm s⁻¹, the trigger force to 10 g (automatic) and the distance to 40 mm. Cutting hardness was calculated as the peak force obtained during cutting of the sample.

The fork test was carried out in the tray kadayif samples with the dimensions of 5×8 cm and 2 cm thickness. As a result of this test, fork hardness, total area and adhesion parameters were calculated. Fork test parameters are as follows: the pre-test speed was set to 1 mm s⁻¹, the test speed to 2 mm s⁻¹, the post-test speed to 2 mm s⁻¹, the trigger force to 5 g and the distance to 15 mm. The fork hardness was calculated as the peak force at 15-mm distance. The total area was calculated as the area under the curve between the initial force and the final force. The stickiness was calculated as the area under the negative peak force that occurs during the separation of the fork probe from the sample.

Sensory evaluation

The sensory analyses of the tray kadayif samples were carried out at the Faculty of Tourism of Atatürk University, and the panelists were selected from the lecturers of the Department of Gastronomy and Culinary Arts. The samples added with sugar syrup were allowed to stand at room temperature for 1 h; then, hazelnut was added and presented to the panelists in the presence of drinking water (Fig. 3). The tray kadayif samples were evaluated in terms of taste, aroma, color, texture and general acceptability by the 14-person panel using a nine-point hedonic scale (9 = like extremely, 5 = neither like or dislike, and 1 = dislike extremely) [21].

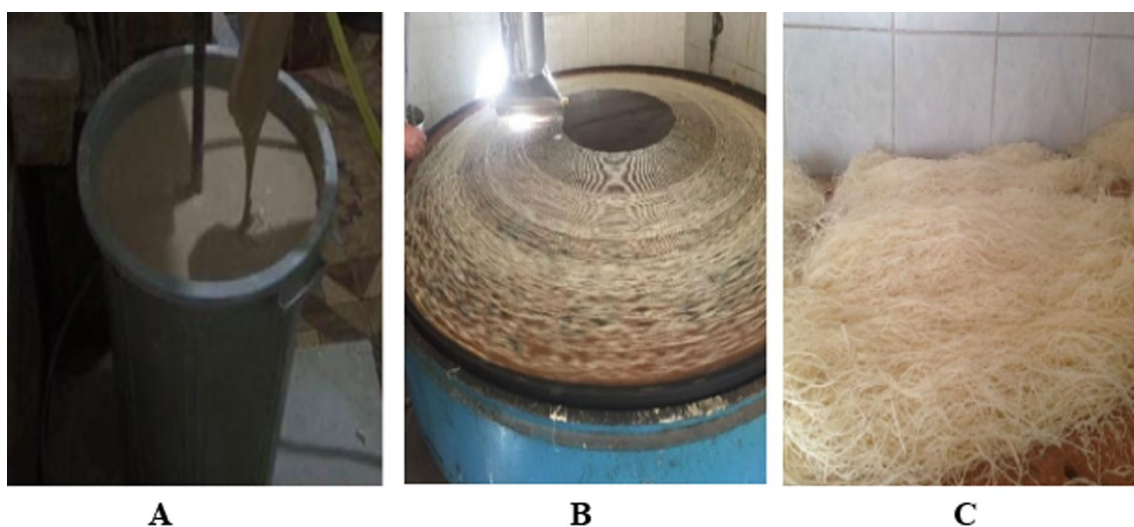


Fig. 2 Tel kadayif production (Seyyedcheraghi, 2019). **A** tel kadayif dough, **B** cooking stage of tel kadayif, **C** tel kadayif



Fig. 3 Tray kadayif samples presented to the panelists

Statistical analysis

All the experiments were carried out in triplicate and in two different trials. Statistical evaluations were performed with the SPSS package (a completely randomized design procedure by SPSS). Means were compared using Duncan's multiple range test at the level of $P < 0.005$. All data are presented as mean \pm standard error (SE).

Results and discussion

The effects of sunflower oil, hazelnut oil, sucrose and glucose syrups on L, +a and +b values of the tray kadayif samples are given in Table 1. The L color values of the tray kadayif samples increased with the addition of sunflower and hazelnut oil, while the +a and +b color values decreased. The highest L color values were determined in formulations containing 25% sunflower oil, and the highest values of +a and +b were determined in formulations without oil (100% butter). The use of sucrose and glucose syrup did not significantly affect the L and +b color values of the kadayif samples, whereas the +a color values were higher in the samples containing glucose syrup.

Textural properties of foods can be determined sensory and instrumentally, but as a result of instrumental texture analysis, quite objective results can be obtained in a short time. As a result of textural analysis, information about the hardness, flexibility, stickiness, fragility and chewiness of the food can be obtained [22, 23]. Figure 2 shows that sunflower oil and hazelnut oil have a similar effect on the textural properties of tray kadayif. The highest hardness values were achieved in formulations without butter in terms of both cutting hardness and fork hardness (Fig. 4A, B). The lowest fork hardness values were obtained in control samples containing

Table 1 The effect of oils and sugar syrups on the color parameters of tray kadayif

Sunflower oil (%)	Hazelnut oil (%)	Syrups	L	a	b
0	0	S	56.6 ± 0.12ef	7.2 ± 0.05ab	26.6 ± 0.01a
		G	55.9 ± 0.50fg	7.6 ± 0.01a	25.8 ± 0.24a
	25	S	55.1 ± 0.63g	6.6 ± 0.08bc	27.1 ± 0.04a
		G	55.3 ± 0.42g	6.0 ± 0.62cd	26.1 ± 0.71a
	50	S	57.8 ± 0.01de	5.6 ± 0.11de	25.6 ± 0.29a
		G	56.7 ± 0.41ef	6.3 ± 0.37cd	26.0 ± 0.45a
25	0	S	57.9 ± 0.10cde	5.0 ± 0.30ef	23.4 ± 0.16b
		G	58.3 ± 0.32cd	4.9 ± 0.09ef	23.2 ± 0.33b
	25	S	58.4 ± 0.28cd	3.4 ± 0.02gh	21.4 ± 0.85cd
		G	59.2 ± 0.70bc	3.4 ± 0.29gh	21.5 ± 0.08cd
	50	S	60.6 ± 0.21a	2.8 ± 0.02h	21.4 ± 0.35cd
		G	59.9 ± 0.02ab	3.1 ± 0.28gh	20.7 ± 0.55d
50	0	S	57.7 ± 0.10de	5.2 ± 0.10ef	22.6 ± 0.03bc
		G	57.2 ± 0.47de	5.2 ± 0.02ef	21.9 ± 1.10bcd
	25	S	58.1 ± 0.51cd	2.8 ± 0.15h	21.9 ± 0.74bcd
		G	57.7 ± 0.54de	3.8 ± 0.14g	22.3 ± 0.02bcd
	50	S	58.3 ± 0.14cd	4.7 ± 0.21f	22.6 ± 0.02bc
		G	57.8 ± 0.58de	5.1 ± 0.29ef	21.9 ± 0.77bcd
		p	**	**	**

Values are mean \pm SE. Different letters in the same column are significantly different (* $P < 0.05$; ** $P < 0.01$). S sucrose syrup, G glucose syrup

100% butter, while the lowest cutting hardness values were determined in formulations containing 50% hazelnut oil and 50% butter. Area values, which can also be referred to as the drilling work obtained from the fork-coming test, increased in general due to the increase in the oil addition (Fig. 4C). The type and amount of oils used in food production are among the most important factors affecting the hardness of food. The type and

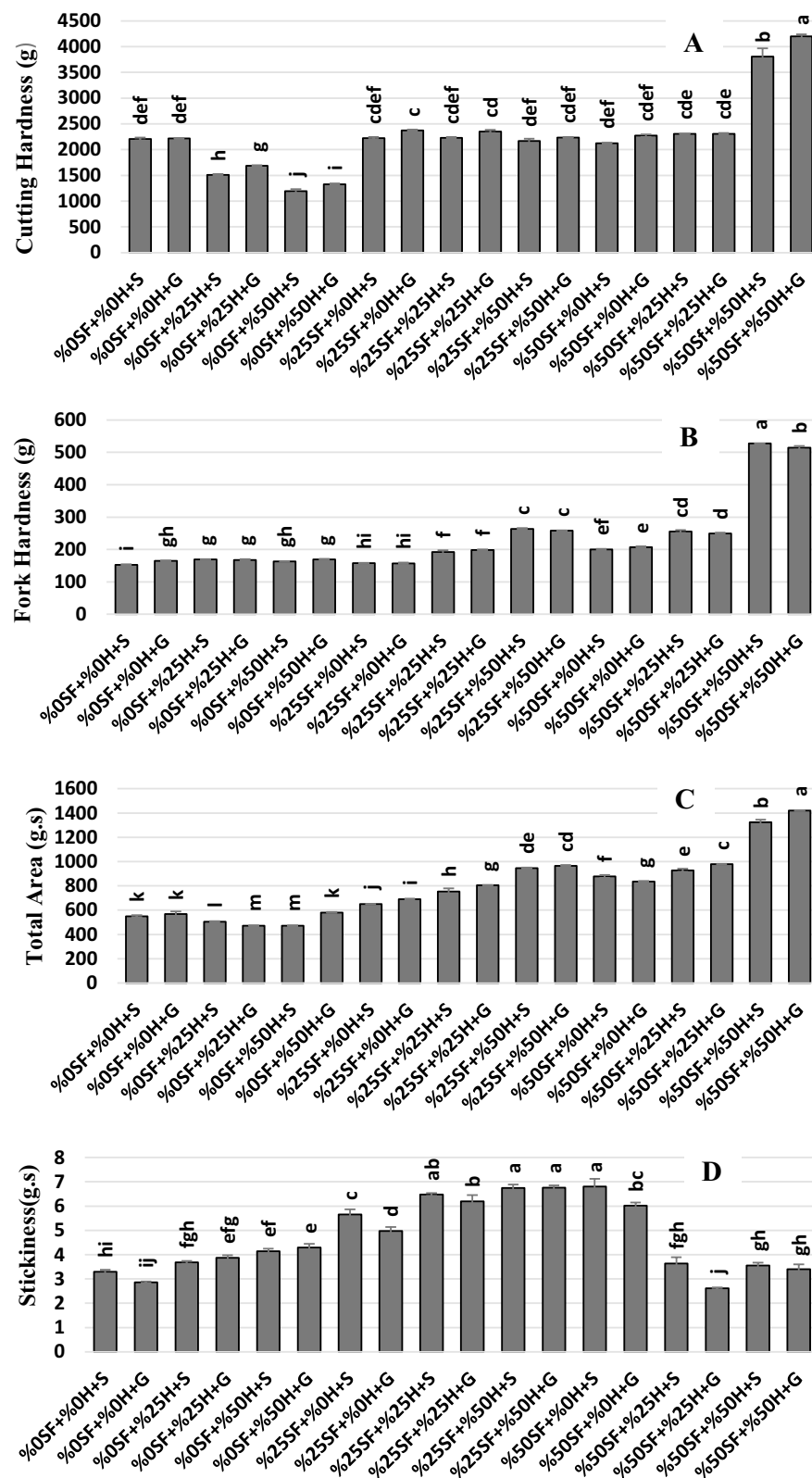


Fig. 4 The effect of oils and sugar syrups on the cutting hardness (A), fork hardness (B), total area (C) and stickiness (D) parameters of tray kadayif

Table 2 The effect of oils and sugar syrups on the sensorial parameters of tray kadayif

Sunflower oil (%)	Hazelnut oil (%)	Syrups	Taste	Aroma	Color	Texture	General acceptability
0	0	S	4.3±0.5f	5.6±0.2abcd	6.7±0.4ab	6.1±0.1abc	5.2±0.4de
		G	4.7±0.5ef	5.8±0.4abcd	6.3±0.5abc	5.6±0.4abc	5.1±0.3de
	25	S	5.9±0.5bcde	6.9±0.1a	7.3±0.4a	7.1±0.1a	6.9±0.2ab
		G	5.6±0.5cde	5.5±0.1abcd	4.4±0.4d	5.7±0.4abc	5.4±0.3cde
	50	S	5.6±0.1cde	6.3±0.2abc	5.8±0.2bc	5.8±0.2abc	5.8±0.6bcde
		G	5.1±0.5def	5.3±1.2abcd	5.8±0.1bc	5.9±0.1abc	5.6±0.6bcde
25	0	S	5.5±0.5cdef	5.0±0.0cd	6.6±0.6abc	6.0±0.2abc	6.1±0.1abcde
		G	5.2±0.5cdef	4.7±0.2d	6.5±0.0abc	5.8±0.3abc	5.3±0.1cde
	25	S	5.6±0.1cde	5.2±0.2bcd	6.5±0.2abc	6.2±1.0abc	6.1±0.1abcde
		G	7.1±0.3ab	6.6±0.3ab	6.2±0.0abc	6.0±0.7abc	6.7±0.2abc
	50	S	7.2±0.2a	6.7±0.7ab	7.0±0.2ab	6.7±0.2ab	7.3±0.1a
		G	6.5±0.2abc	6.2±0.5abcd	5.8±0.1bc	5.8±0.3abc	6.5±0.2abcd
50	0	S	4.6±0.3ef	5.5±0.1abcd	6.0±0.4abc	5.0±0.4c	4.7±0.5e
		G	5.6±0.1cde	5.5±0.1abcd	5.2±0.4cd	5.2±0.4bc	5.4±0.2cde
	25	S	6.2±0.2abcd	5.6±0.6abcd	6.3±0.3abc	6.0±0.2abc	6.1±0.1abcde
		G	5.3±0.3cdef	5.5±0.2abcd	5.7±0.5bc	5.6±0.6abc	5.8±0.1bcde
	50	S	5.1±0.1def	5.7±0.1abcd	5.8±0.1bc	5.8±0.3abc	5.7±0.9bcde
		G	4.7±0.1ef	5.2±0.5bcd	5.2±0.1cd	4.9±0.4c	5.2±0.4de
		<i>P</i>	**	ns	*	ns	*

Values are mean ± SE. Different letters in the same column are significantly different (* $P < 0.05$; ** $P < 0.01$). S sucrose syrup, G glucose syrup, ns not significant

content of the oil used in production affect the fragility and contribute to the taste of food [24]. On the other hand, the cutting hardness values of the samples containing sucrose syrup were lower than those of samples containing glucose syrup, and this difference was found to be statistically significant ($P < 0.01$). Consumers do not want very hard kadayif, so the use of sucrose syrup in production is thought to be more accurate in terms of textural properties.

While stickiness is defined as the ability of the food to hold on the teeth during chewing [25], it is explained as the probe holding ability of the product under test in instrumental analysis. The stickiness values, which express the integrity of the food, reached the highest level in formulations containing 50% sunflower oil, 50% butter and 0% hazelnut oil (Fig. 4D). The closest stickiness values to this formulation were obtained in formulations containing 25% sunflower oil, 25% butter and 50% hazelnut oil. In formulations containing 100% oil, the stickiness values were determined to be lower than formulations containing 25% butter. This result shows an increase in stickiness values due to the increase in the amount of butter in tray kadayif formulations. When the sugar syrups were compared, the stickiness values of the samples with sucrose syrup were found to be higher than the samples with glucose syrup. For this reason, the use

of sucrose syrup in tray kadayif production may be more accurate for product integrity.

Acceptability of any food depends on many factors such as the sensory attributes of food, cost, nutritional value and product image. Studies show that the high nutritional value of a food does not guarantee that the food will be accepted by the consumers [26]. Fats are among the most important components affecting the sensory properties of foods. The fat contained in the food is important for the feelings that food leaves in the mouth during consumption [27]. As a result of the sensory analysis conducted, though all the formulations were accepted by panelists, the highest score from the panelists was received by the formulations containing 75% butter and 25% oil (sunflower and hazelnut oil) (Table 2). The formulations containing 100% butter received lower scores than the formulations containing 50% butter from panelists. It was determined that the tray kadayif samples prepared with sucrose syrup had higher scores than the samples prepared with glucose syrup in terms of sensory properties.

Conclusions

In this study, the effects of hazelnut oil, sunflower oil, butter, sucrose syrup and glucose syrup on the physical, textural and sensory properties of the tray kadayif

of Turkish cuisine were determined. In general, due to the increase in the amount of oil in the formulations, an increase in L color values of the tray kadayif samples and a decrease in +a and +b color values were observed. In the texture analysis of the tray kadayif samples, hazelnut oil and sunflower oil increased the hardness of the tray kadayif samples, and the highest hardness values were reached in formulations without butter. For this reason, it has been observed that the use of butter in formulations in tray kadayif production is very important in terms of obtaining the crispness and hardness desired by consumers. According to the results of the sensory analysis, the increase in the amount of sunflower oil and hazelnut oil in the tray kadayif samples decreased the appreciation of the panelists in general. It has been observed that panelists prefer formulations in which butter and oil used together rather than formulations containing 100% butter or 100% oil. However, it has been understood that the level of butter should not be reduced below 50% in terms of sensory properties when using butter and oils together. In addition, it has been determined that the use of sucrose syrup instead of glucose syrup in tray kadayif production increases sensory appreciation.

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Author contributions

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Availability of data and materials

All data and materials are presented in this manuscript.

Declarations

Competing interests

The authors declare that they have no conflicts of interest.

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