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Encouraging Indigenous Architecture for Sustainable Urban Growth – case of Kolkata

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Abstract

Over the last few decades, urban centers have experienced a steady environmental degradation, contributing to an overall lack of comfort in them. Kolkata, a prime urban megalopolis in the Eastern Gangetic plain of India, is no exception to this phenomenon. In today's city-centric development, urban centres have turned into heat sinks. This rise in temperature is instigating the citizens to use more of mechanical cooling devices, which in turn increase the external temperature by throwing out the inner heat of the building outside, thus creating an endless cycle. Sustainable development approaches of Smart City initiative have recently encouraged planners and architects alike to think and act in order to break this cyclic climatic degradation.

The first part of the paper intends to inspect these critical climatic conditions on a tangible measurable platform, thus establishing the need for a planned intervention into it. This paper then intends to tap a non-conventional solution to the problem. It hypothesizes the comparative supremacy of old indigenous buildings of the existing urban fabric of Kolkata over its newer buildings, and then inspects and tests the hypothesis through climatic measurements carried out in both indigenous and newer buildings.

Analysis and inferences drawn from the climatic measurements would prove the hypothesis to be right or wrong. If the supremacy of indigenous structures is proven, it would then be the onus on the lawmakers to incorporate the unique design inputs of the old buildings into the newer architecture judicially in order to achieve a better thermal performance of the latter.

Key words

Indigenous Architecture, Thermal performance, Sustainability

1. INTRODUCTION

The climatic zoning map of India reveals most of it falling under hot regions having extreme summer conditions. These zones, during the three long months of summer in India, suffer from the extreme heat conditions that becomes further un-bearable when coupled with high humidity levels. For last few decades, the hot metropolitan urban centres of India are getting warmer, and future predictions by the end of the century portray a very grim future for their residents [1].

This increasing thermal discomfort is increasing the use of air conditioning in built environment by those who have the affordability to do so. Ironically, the use of air conditioning is further contributing to the urban heat sinks, making micro-climatic zones having higher temperature than their surroundings [2].

The income disparities of Indian population has grown drastically, where the top 1% of the population (in terms of their wealth) has seen a steady increase of over 5% since the turn of the millennium, whereas the bottom 50% in the income table has seen a sharp fall of almost the same 5% during the same tenure [3]. The constant rise in thermal discomfort of the

urban centres affects this lower 50% of the population, who mostly has to undertake tertiary sector jobs and thus can afford no better than the minimum comfort of basic housing – circumstances that deny the indoor comfort of conditioned houses. A solution must have to be sought to arrive at an acceptable solution – a solution that would be equitable to all economic strata of the society, and would be sustainable even till the distant future. Research has shown that vernacular and indigenous houses, by virtue of being developed over prolonged period of time and thus respecting the local climate to a larger extent, are frequently found to be more climate responsive and thermally comfortable. This paper thus turns toward the old climate-friendly architecture of yester-years, seeking solution from their indigenous knowledge.

Kolkata, erstwhile capital of British Indian Empire as Calcutta, has a legacy of indigenous buildings that blend the traditional Indian architecture of medieval Bengal along with the European architecture brought in by the colonial British rulers. The paper explores these indigenous houses of Kolkata and assesses their thermal comfort against their modern counterpart to seek solution to counter-balance the growing thermal discomfort condition of Indian cities.

2. AIM AND OBJECTIVE

The paper aims at assessing whether indigenous architecture of Kolkata performs better than the contemporary style of architecture in the residential sector. This assessment was based on comparison of outdoor climatic data vis-à-vis thermal comfort data inside various residential buildings sampled in the research.

The research had an objective to record climatological data for sample number of indigenous as well as contemporary residential buildings, and then find out, through analysis, which one performs better under the same climatic condition during summer months in Kolkata, India.

3. KOLKATA & INDIGENOUS ARCHITECTURE

The city of Kolkata was historically founded by a British merchant by the name of Job Charnock in the year 1690 on the bank of river Hooghly, a branch of river Ganges in India [4]. Although chronology of establishment of British Calcutta is dated as 1690, major building activities started after the East India Company defeated the Nawab of Bengal in 1757 in the Battle of Plassey. Indian Independence, in 1947, however gave wake to a new typology of buildings that followed the American architectural practice as well as the post-War European architecture to a great deal. The architectural typologies of the city, therefore, have been divided into three distinct temporal groups as follows:
(a) Pre-Colonial Period (from antiquity till 1757)

• Original mud and bamboo houses of Bengal

• Brick and stone houses of Muslim Bengal

(b) Colonial Period (1757 – 1947)

• Brick and iron (later steel) houses of British colonial Calcutta

• Indigenous *pucca* houses of local rich landlords, merchants and well-off citizens

(c) Post Independence Period (since 1947)

• Post-world war and post-independence american influence on architecture

• Recent “international” style houses of kolkata – RCC and Glass Facades

In the following section, brief introductions on the three typologies have been given.

3.1. Pre-Colonial Architecture of Kolkata

Calcutta, before the advent of British East India Company, was a hamlet – full of flora and marshes located in the buffer area of Sunderbans Forest, the largest mangrove forest of the world. The settlement had the traditional built form of northern Gangetic plain of India – mud house with bamboo support and sloped roof covered with either tiles or thatch [5]. Pukka houses belonging to the wealthy used terracotta bricks, small in size, or stone for constructing their mansions. The design of these mansions followed the medieval building typologies having various layers of privacy [6].

3.2. Colonial Architecture of Kolkata

Under the British rule the city of Calcutta grew as one of the largest urban centre of Asia. Being the capital of the empire, the city not only housed important government buildings or mansions for the ruling class, it also accommodated the Indian administrative class of kings, nawabs, zaminders and merchants, along with their beautiful palaces. These buildings owed their design legacy from various sources –

(a) The traditional courtyard-centric house-forms of rural Bengal [7]

(b) The medieval socio-economic lifestyle of the Bengal and their design similarity with Haveli of northern India [8], and

(c) The British architecture and construction from the time of Renaissance and post-Industrial Revolution Europe [9].

The amalgamation gave birth to two distinct genre of architecture, viz. the British Mansions designed and meant for the rulers and the Indigenous Palaces and Houses, meant to accommodate the Indians [10]. Primary building material of this era were burnt bricks, timber, iron steel, glass and stone (for cladding) [11]. The paper, in its study, considers the latter as one of the prototypes.

3.3. Post Independence Architecture of Kolkata

The end of the Second World War saw a steady influx of population into the city from its hinterlands. The fear of Japanese aggression on the eastern border of British India and the devastating famine of Bengal attributed to this. As a result, a new resident design typology emerged that put more importance to utilization of space than luxury of abundance. This design approach initially borrowed from the American free plan of the early 20th century, but soon turned towards the more utilitarian way of steel or RCC frame and brick and glass skin structures, colloquially called the International style of architecture [12].

3.4. Climate Condition of Kolkata

Figure 1: Climatic zone map of India as per Koppen's classification

Climate data for Kolkata (Alipore) 1971–1990 [hide]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	32.8 (91)	38.4 (101.1)	41.1 (106)	43.3 (109.9)	43.7 (110.7)	43.9 (111)	39.9 (103.8)	38.4 (101.1)	38.9 (102)	39.0 (102.2)	34.9 (94.8)	32.5 (90.5)	43.9 (111)
Average high °C (°F)	26.4 (79.5)	29.1 (84.4)	33.5 (92.3)	35.3 (95.5)	35.4 (95.7)	34.0 (93.2)	32.3 (90.1)	32.1 (89.8)	32.4 (90.3)	32.3 (90.1)	30.3 (86.5)	27.0 (80.6)	31.7 (89.1)
Daily mean °C (°F)	20.1 (68.2)	23.0 (73.4)	27.6 (81.7)	30.2 (86.4)	30.7 (87.3)	30.3 (86.5)	29.2 (84.6)	29.1 (84.4)	29.1 (84.4)	28.2 (82.8)	24.9 (76.8)	20.8 (69.4)	26.9 (80.4)
Average low °C (°F)	13.8 (56.8)	16.9 (62.4)	21.7 (71.1)	25.1 (77.2)	26.0 (78.8)	26.5 (79.7)	26.1 (79)	26.1 (79)	25.8 (78.4)	23.9 (75)	19.6 (67.3)	14.5 (58.1)	22.2 (72)
Record low °C (°F)	6.7 (44.1)	7.2 (45)	10.0 (50)	16.1 (61)	17.9 (64.2)	20.4 (68.7)	20.6 (69.1)	22.6 (72.7)	20.6 (69.1)	17.2 (63)	10.6 (51.1)	7.2 (45)	6.7 (44.1)
Average rainfall mm (inches)	11 (0.43)	30 (1.18)	35 (1.38)	60 (2.36)	142 (5.59)	288 (11.34)	411 (16.18)	349 (13.74)	288 (11.34)	143 (5.63)	26 (1.02)	17 (0.67)	1,800 (70.87)
Average rainy days (≥ 1.0 mm)	1.2	2.2	3.0	4.8	8.7	14.7	20.5	20.2	15.7	8.1	1.5	0.9	101.5
Average relative humidity (%)	66	58	58	66	70	77	83	83	81	73	67	68	71
Mean monthly sunshine hours	203.9	201.2	225.8	235.4	227.1	123.1	93.1	104.9	116.2	182.6	190.8	203.4	2,107.5

Figure 2: Climate condition table of Kolkata [https://en.wikipedia.org/wiki/Kolkata]

Kolkata has Tropical Wet and Dry climate, having humid to very humid climate for most of the year and a relatively dry winter (Fig. 1). Temperature can go up to 43.9°C during summer in June, and a simultaneous high humidity condition further aggravates the situation (Fig. 2).

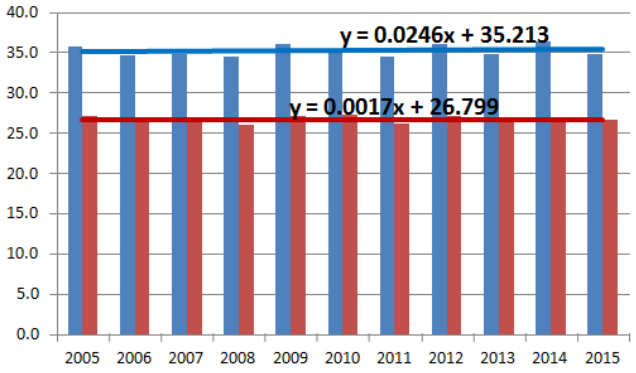

Figure 3: Fluctuation of Maximum and Minimum Temperature across years from 2005 till 2015

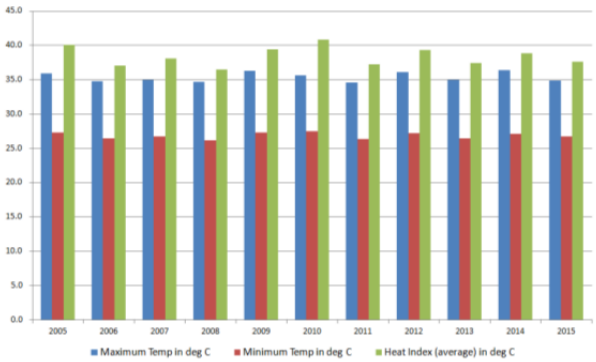

Figure 4: Kolkata – Climate Trend during 2005 - 2015

The above figures, derived from the meteorological data recorded during 2005 – 2015 shows the present condition of climate of Kolkata during the summer months. Whereas figure 3 shows a steady rise, both in the maximum as well as minimum temperature, figure 4 shows us how, except 2009 and 2010, the composite Heat Index of Kolkata is also on a rise.

This particular phenomenon, inherent mostly in urban centers of India, is due to building up of heat sinks in cities. These localized heat sinks necessitate an increased use of air conditioning to enhance the indoor thermal comfort [13]. The air conditioners, on the other hand, 'throw' the heat outside – thus contributing and aggravating the heat sinks. The climatic scenario of summer months in Kolkata thus states an un-deniable fact that solutions to attain better indoor thermal comfort must come from some alternate path of creating building envelopes that would be more 'insulating' and those which 'breathe' better than the present day solutions.

4. RESEARCH METHODOLOGY

The research thus aimed at selecting certain buildings from the city of Kolkata that became its case samples. These buildings were chosen from two major types –
(1) Old indigenous residences, the criteria for selection being residential buildings older than 1947 and not more than 4 storey high. For the purpose of study 2 buildings were chosen as follows –
(a) Chakraborty House at Nebu Bagan By-lane, Bagbazar, Kolkata

(b) Lahiri House at Khidirpur, Kolkata

(2) New residential buildings, preferably not more than 30 years of age and not more than 4 storey in height. For the purpose of study, three new buildings were chosen as follows –
(a) Roy Residence at Bangur Avenue, Kolkata

(b) Datta Residence at Kombuli Tala By-lane, Bagbazar, Kolkata

(c) Mitra Residence at Bangur Avenue, Kolkata

Brief description, along with plans and photographs of these study houses are given below for perusal.

4.1. Chakraborty House, Bagbazar

This house, built between 1890 – 1900, is a three storied building designed to enclose a courtyard as an L-shaped mass (Fig. 5). The structural system of the house is load bearing wall and cement concrete slab, with steel joists used for spanning the long living rooms. Originally built as a double storied residence, the third floor was added after independence.

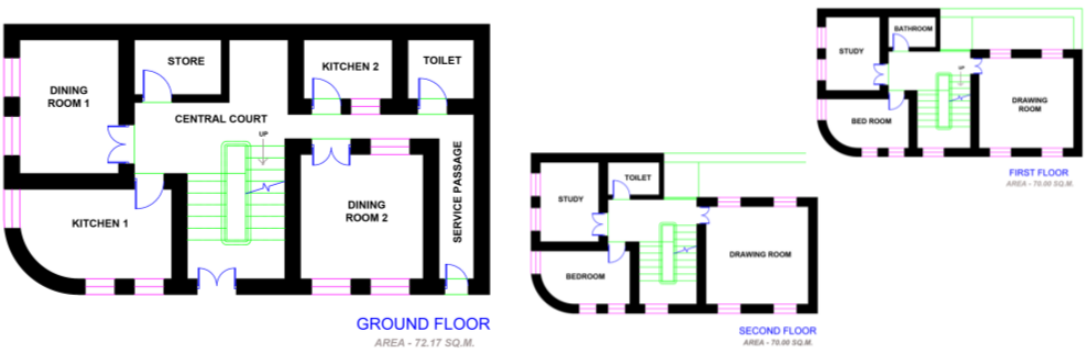

Figure 5: Floor plans of Chakraborty house

4.2. Lahiri House, Khidirpur

Built between 1870 – 1875, this house was originally designed for a wealthy feudal *zamindar* family. After independence, a portion of the double storey mansion was acquired by the Lahiris (Fig. 6), descendants of whom stay in the house now. The house suffers from dereliction due to want of adequate repair and maintenance. Originally meant to enclose a courtyard on all three sides, partial acquisition of the mansion by different owners has resulted into loss of identity for each part. Independent and non-coherent repair and modification has also contributed to this. However, much of the original massing and construction is retained in the portion under study and hence, the spatial and thermal originality is also ensured.

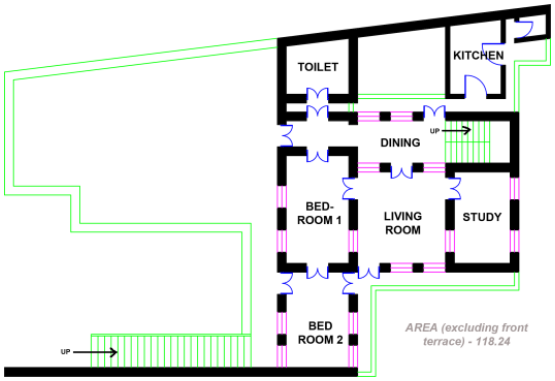

Figure 6: Plan of Lahiri house

4.3. Roy Residence, Bangur Avenue

The residence of Roy is a dwelling unit in a multiple unit apartment building. These types of residential buildings are now most common in Kolkata. Because of the design restrictions, these dwelling units, in most cases, remain deprived of openings on any 2 – 3 cardinal directions. The building housing the Roy family has been built during 1985 – 90, and is a G+3 storied house. The Roy residence is in the 2nd floor (Fig. 7).

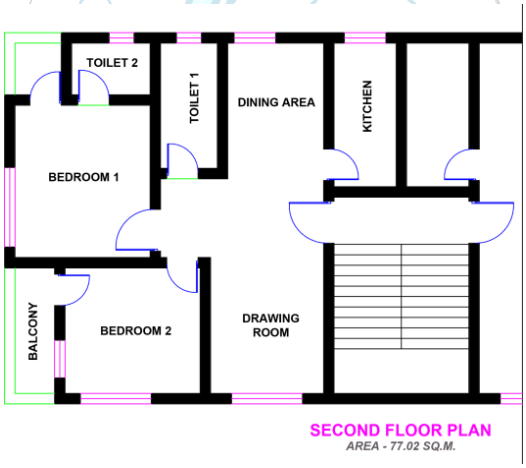

Figure 7: Plan of Roy residence

4.4. Datta Residence at Kombuli Tala By-lane, Bagbazar

The residence of Dutta family is housed in the 2nd floor of a G+3 storied house that has been built in 2014 (Fig. 8), and is the latest of all the three new houses studied. It actually comprises of two dwelling units fused together, and is therefore open on all sides, unlike other study units.

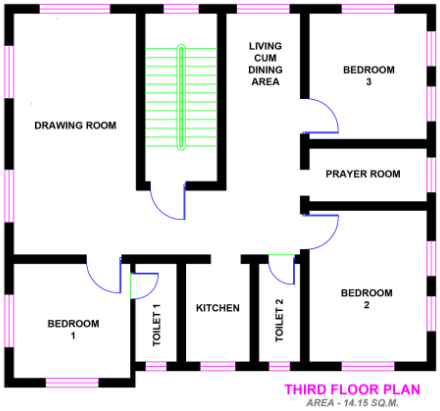

Figure 8: Plan of Dutta residence

4.5. Mitra Residence at Bangur Avenue

The Mitra residence is the smallest and most constricted of all 5 buildings studied as part of the research. It is a unit located in the first floor of a G+3 storied building. Only very small portion of it enjoys external openings on the south and west side. Unlike other houses studied, this unit is shaped elongated (Fig. 9).

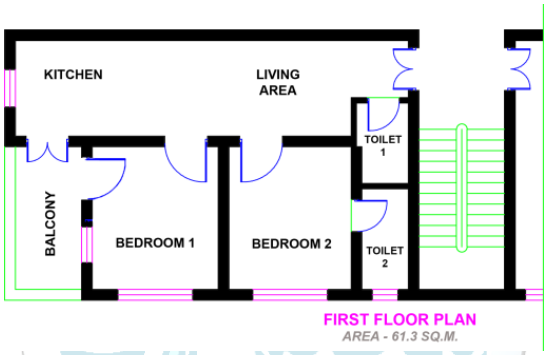

Figure 9: Plan of Mitra residence

5. DATA COLLECTION AND ANALYSIS

The temperature and relative humidity data are collected with the help of Data Loggers simultaneously in all the 5 residence in the end of May, 2017 for continuous 48 hours (2 days) at an interval of 30 minutes. Hence, each dataset is comprised of approximately 200 observations.

On the basis of these data, the value of thermal perception in the form of Heat Index is calculated as per the following equation (given by NOAA National Weather Service website) [14]:

HI = -42.379 + 2.04901523t + 10.14333127r - 0.22475541tr - 0.00683783t2 - 0.05481717r2 + 0.00122874t2r + 0.00085282tr2 - 0.00000199t2r2

where,

HI = Heat Index (in degree Fahrenheit)

t = Ambient Dry Bulb Temperature ((in degree Fahrenheit)

r = Relative Humidity (percentage value between 0 and 100)

The findings have been put into line diagram charts, and the diagrams and their respective observations are discussed in the following section.

5.1. Chakraborty House, Bagbazar

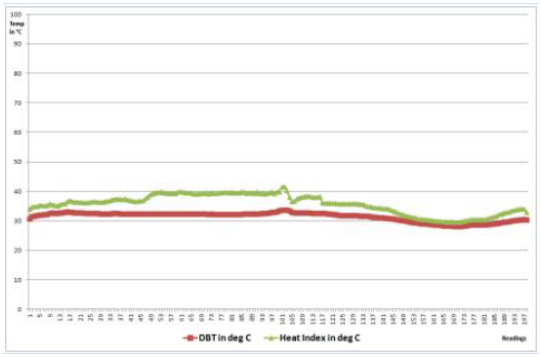

Figure 10: DBT and HI curve for Chakraborty house

Figure 11: Relative Humidity curve for Chakraborty House

5.2. Lahiri House, Khidirpur

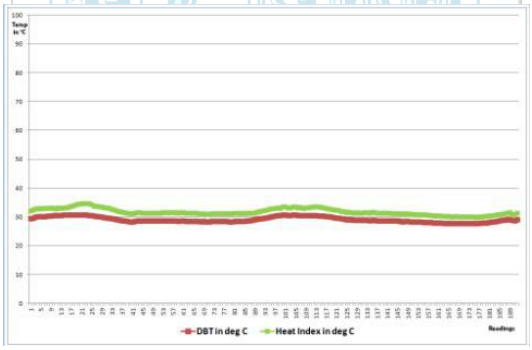

Figure 12: DBT and HI curve for Lahiri house

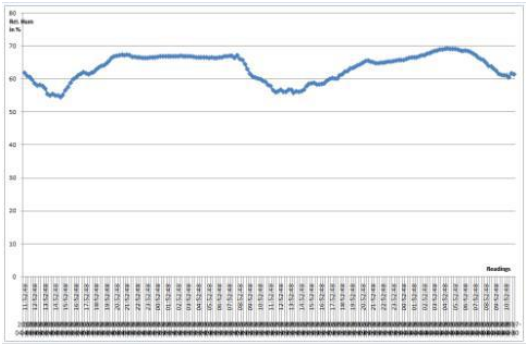

Figure 13: Relative Humidity curve for Lahiri house

The heat index values for the old building of Chakraborty family (Fig. 10) as well as that in the old building of Lahiri families (Fig. 12) show a trend running parallel to the dry bulb temperature, with almost no fluctuation in its value.

5.3. Roy Residence, Bangur Avenue

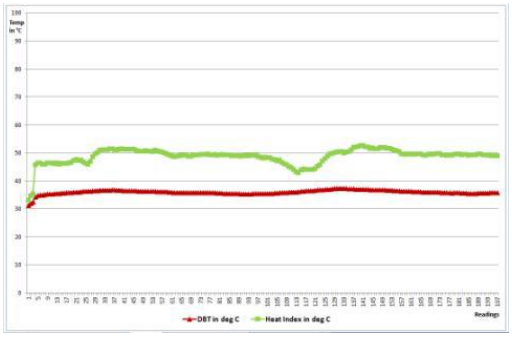

Figure 14: DBT and HI curve for Roy residence

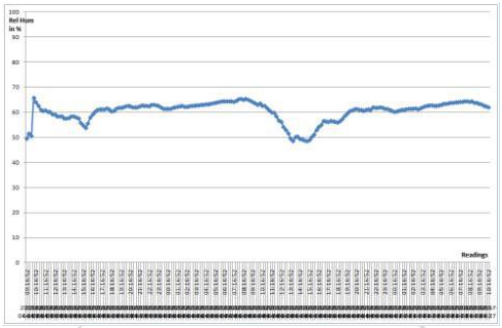

Figure 15: Relative Humidity curve for Roy residence

5.4. Datta Residence at Kombuli Tala By-lane, Bagbazar

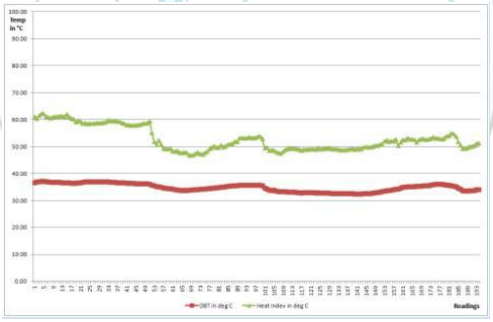

Figure 16: DBT and HI curve for Dutta residence

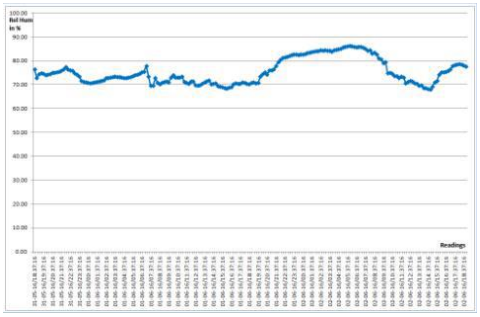

Figure 17: Relative Humidity curve for Dutta residence

5.5. Mitra Residence at Bangur Avenue

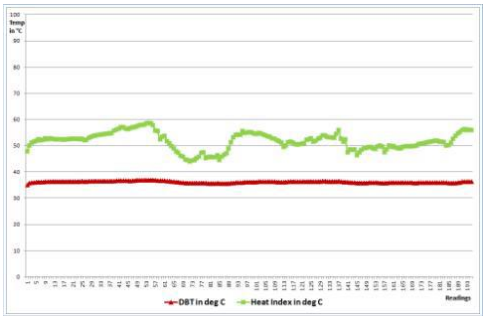

Figure 18: DBT and HI curve for Mitra residence

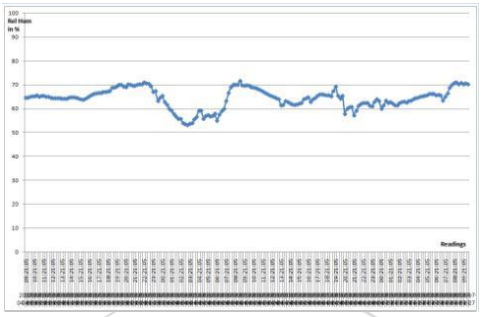

Figure 19: Relative Humidity curve for Mitra residence

The graphs showing variation of temperature in the residences of Roy (Fig. 14), Dutta (Fig. 16) and Mitra (Fig. 18) shows a sharp rise from the trend shown by the recorded DBT. This can be attributed to the fluctuations of RH in the new buildings (Fig. 15, 17 and 19).

5.6. Comparative Analysis

A comparison of the findings show that while in the old buildings the trend of Heat Index does not shift much from the DBT curve, in the new buildings the HI curve has fluctuated considerably. As Heat Index is the factor responsible for the actual comfort condition of the inmates of the houses, a sharp rise in its value grossly deteriorates the overall comfort condition of the house. Further analysis of the data recorded and computed therein in Table 1 below also shows this wide gap between the average values of DBT and HI in the new buildings (*column 4*), especially in comparison to the conditions in old buildings.

Table 1: Comparison of Average Temperature condition in Surveyed Houses

Building Name and Type	*Average Dry Bulb Temperature (DBT) in ℃*	*Average Heat Index (HI) value in ℃*	*Difference in ℃*
(1)	*(2)*	*(3)*	*(4)*
Chakraborty House, OLD	**32.30**	**36.67**	**4.37**
Lahiri House, OLD	**29.94**	**32.56**	**2.62**
Roy House, NEW	**36.89**	**49.51**	**12.62**
Dutta House, NEW	**35.65**	**53.65**	**18.00**

A vertical comparison along column (2) of Table 1 also shows that while the average DBT in the old buildings is 31.12ºC that for the new buildings is 36.27ºC, with a considerable difference of over 5ºC. However, a comparison of column (3) of the table shows a difference of almost 17ºC between the HI of old buildings being 34.62ºC and that of new buildings being 51.58ºC.

6. CONCLUSION

Thus the collected and analysed data indicates to prove the hypotheses “Old Indigeneous Houses are Thermally More Comfortable than Newly Designed and Constructed Houses” to be CORRECT.

This may, however, be contributed to many factors, such as

- Higher thickness of wall.
- Better cross ventilation due to strategic location of windows.
- Existence of courtyard in house – leading to more of stack effect.
- Shading devices outside openings, locally known as chajjas.
- Use of local materials such as burnt bricks, lime, mud etc over non-indigenous materials such as cement and glass.

The paper thus concludes with a note to further the research to establish, in due course of future studies, concrete relationships between various contributing components of a building to its thermal comfort. This will, the authors envisage, propagate a guideline to create more suitable building design guidelines arising out of the actual climatological and geographic context of the city of Kolkata.

BIOGRAPHY

Sanmarga Mitra is an architect from Jadavpur University, Kolkata and a planner from IIT Kharagpur. He is Assistant Professor in the Department of Architecture, SPA Bhopal, INDIA and has been teaching architecture and planning in Birla Institute of Technology, Mesra and its International Centre at Ras-al-Khaimah, UAE for a decade previously. His interests are in history of architecture and structural behaviour of buildings. He is presently pursuing research on thermal behaviour of indigenous and traditional buildings.

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Polyphenols in Traditional Sour Cherry Liqueurs - Beverages with Health Benefits

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Abstract

The polyphenolic compounds of two traditionally obtained sour cherry liqueurs were evaluated. Liqueurs were prepared of ripe fruits, with addition of sucrose and food grade ethanol. The maceration process was performed with exposure on direct sunlight for the liqueur LA, and in dark at room temperature for the second one (LB), in period of 40 days. After aging of 6 months in dark fruits were separated from the liquid. The obtained liqueurs were analyzed on HPLC-DAD system, and the individual components were identified with LC-ESI-MS system. In both sour cherry liqueurs the presence of 36 phenolic compounds was identified. However, the phenolic profiles of both liqueurs differed significantly due to preparation conditions, and they were also different from that of sour cherries used as raw material. It was estimated that in the moment of analysis the total phenolics recovery was only 15.72% for the liqueur prepared with exposure to sunlight during maceration, and 20.65% for the one where maceration was carried in dark.

Key words

Liqueur, Sour cherry, Polyphenols, HPLC, LC-MS

1. INTRODUCTION

Liqueurs have been prepared and consumed as part of the European culture for more than five centuries [1]. Nowadays liqueurs of many different types are widespread and very popular beverages among the consumers. Their production involves maceration of fruits and/or herbs into hydroalcoholic solutions during a certain period of time, with or without addition of sweetener. This process ends with maturation period of at least three months [2]. Fruits and herbs are rich sources of aromatic and polyphenolic compounds. When raw material is introduced into alcohol these compounds are extracted, passing into the liquid and enriching it [3]. The contents of phenolics in finished product depend on the composition of raw material, applied preparation technique, presence of other substances, and finally the storage conditions. The fruit maturity also has great impact on polyphenolic composition of liqueurs, since the contents of polyphenols decrease with fruit ripening [4].

The polyphenols are important and one of the most present classes of secondary metabolites in higher plants, especially in medicinal and edible plants [5]. They are responsible for the color and flavor of fresh and processed

foods. Moreover, today's tendency is these phytochemicals to become significant part of common human diet, because of their documented antioxidant, anti-inflammatory, anticancer and cardio-protective effects [6], [7]. In that way, fruits are proven and reliable sources of polyphenolics, and one of the well-known fruits worldwide are sour cherries. They are rich with sugars, acids, vitamins, minerals, and different polyphenols [8]. Besides consumption in fresh and processed form, sour cherries are also used for preparation of liqueurs. Polyphenolics in sour cherry fruits and their respective products are represented by two main groups of substances, namely non-flavonoid (phenolic acids, basically hydroxycinnamic derivates) and flavonoid (anthocyanins, flavonols and flavan-3-ols) compounds [8], [9], [10]. Anthocyanins are the main phenolics responsible for the color of red fruit beverages. Their astringency and bitterness are result of the phenolic acids and flavan-3-ols. On the other hand, hydroxycinnamic acids and flavanols, and also flavonols, act as co-pigments of anthocyanins [11]. Overall, all present phenolic compounds participate in numerous chemical reactions during the fruit processing (e.g. maturation process) and product storage, undergoing many different transformations [12].

The objectives of this study were to evaluate the polyphenolic compounds present in two traditionally obtained sour cherry liqueurs, and to investigate the influence of preparation conditions on polyphenols in both liqueurs.

2. MATERIALS AND METHODS

The liqueurs were prepared from sour cherry fruits of Oblachinska variety (OS), from the harvest season 2015. The ethanol (food grade quality) was purchased from Alkaloid Ltd (Skopje, Macedonia), and the sucrose (food grade) from the local food supplying store. Chemicals for preparation of sour cherry extract with quality of analytical grade were purchased from Alkaloid Ltd (Skopje, Macedonia) and Sigma-Aldrich GmbH (Steinheim, Germany). The chromatographic analysis was performed using standards (cyanidin-3-glucoside; cyanidin-3-rutinoside; peonidin-3-glucoside; pelargonidin-3-glucoside; quecetin-3-rutinoside; quecetin-3-galactoside; kaempferol glucoside; isorhamnetin glucoside; catechin; epicatechin; procyanidin B1; procyanidin B2; chlorogenic acid; neochlorogenic acid; 4-caffeoylquinic acid) and reagents of HPLC quality grade purchased from Sigma-Aldrich GmbH (Steinheim, Germany) and Fluka GmbH (Buchs, Switzerland).

Sour cherry extract prepared according the procedure presented by [13] was used for quantification of the phenolics (HPLC analysis) in the raw material. The eight-step extraction was carried out using 25 g of plant material and solvent in ratio 1:1, and the extracts were collected in 250 ml flask. A mixture containing methanol and distilled water in ratio 60:40, acidified with 1% w/v hydrochloric acid was used as solvent. Sour cherry extract was prepared in five repetitions. For the purpose of polyphenolics identification (LC-MS analysis) another extract was prepared. Namely, 1 g sample was mixed with 10 mL of extraction solution (methanol acidified with 3% w/v formic acid). The mixture was placed in cooled ultrasonic bath for 1 h, then centrifuged at 10000 rpm for 7 min at 4°C, and finally the supernatant was separated. This procedure was repeated five times. Both types of extracts were filtered through 0.2 μm pore size polyamide filter (Cromafil AO-20/25), and transferred into vials prior to analysis.

Two types of sour cherry liqueurs were prepared according to a traditional recipe. Namely, ripe sour cherry fruits were placed in jars together with sucrose (in proportion 2:1), during the summer season 2015. Immediately, ethanol (50% v/v) in quantity sufficient to cover the content in the jar was added. The jars were sealed, and exposed to direct sunlight in first case (liqueur LA), and in the second they were stored in dark at room temperature (liqueur LB). The maceration process took place 40 days in both cases. After 6 month period of aging at dark place, the fruits were separated from the liquid. The obtained liqueurs were filtered through 0.2 μm pore size polyamide filter (Cromafil AO-20/25) and transferred into vials, prior to analysis.

The analysis of phenolic compounds in the sour cherry liqueurs was performed on Dionex Ultimate 3000 UHPLC system (Thermo Scientific, San Jose, CA) with diode array detector at 280 nm (flavan-3-ols), 350 nm (flavonols and phenolic acids), and 530 nm (anthocyanins), using a Gemini C18 column (150 x 4.6 mm, 3 μm; Phenomenex) operated at 20 °C. The elution solvents were prepared of 0.1% (w/v) formic acid and 3% (w/v) acetonitrile in double distilled water for solvent A, and 0.1% (w/v) formic acid and 3% (w/v) double distilled water in acetonitrile for the solvent B. The elution was carried out using a linear gradient from 5 to 20% B in the first 15 min, followed by a linear gradient from 20 to 30% B for 5 min, then an isocratic gradient for next 5 min, followed by a linear gradient from 30 to 90% B for 5 min, and then an isocratic mixture for 15 min before returning to the initial conditions. The injection volume was 20 μL, and the flow rate 0.6 mL min^{-1}.

The identification of the phenolic compunds was performed using a mass spectrometer (Thermo Electron LCQ Deca XP MAX, Thermo Finigan, San Jose, CA) with an electrospray ionization (ESI) operating in negative (all phenolic groups execpt for anthocyanins) and positive (for anthicyanins) ion mode, according to the method described by [14].

Statistics was performed using Minitab 17 Statistical Software (Minitab Inc., USA), conducting the one-way ANOVA.

3. RESULTS AND DISCUSSION

Liqueurs are alcoholic extracts of different fruits and herbs, and could be perceived as cocktails of polyphenols [4]. Sour cherry liqueurs were prepared according two different traditional recipes, and then analyzed for their polyphenolic profile. Liqueurs were prepared during the summer season of 2015. The main difference in preparation procedure among both liqueurs was the maceration process. In the first case maceration was performed by exposing the mixture of sour cherries, alcohol and sucrose on direct sunlight (liqueur LA), and in the second the same mixture was placed in the dark place at room temperature (liqueur LB). During the 40 days of maceration process the average exposure of the mixture (LA) to direct sunlight was 8 hours, at average temperature of about 47 °C. On the other hand, the preparation of liqueur with maceration in dark (LB) was characterized by almost constant temperature (25 °C) during the entire period of 40 days. The aging for both liqueurs was carried out in same conditions in dark, from September to February, with minor fluctuations in temperature (it dropped gradually from 22 °C in September to 20 °C in February). All conditions during the processes of preparation and aging of liqueurs contribute to changes of the present components. Numerous factors affect the stability of flavonoids and phenolic acids, including pH, temperature, and the presence of co-pigments, metal ions and sugars, but also the nature of the extracting matrix [15].

*Table 1. Total polyphenolic contents and relative proportions (%) of the different groups of phenolic compounds in the sour cherry liqueurs (LA and LB) and sour cherry fruits (OS)**

Sample	Total polyphenolics content (mg/mL)	Relative proportions of the phenolic compounds (%)			
		Anthocyanins	Flavonols	Flavan-3-ols	Phenolic acids
LA	450.78 ± 11.58^{c}	20.37 ± 0.28^{c}	21.09 ± 0.79^{a}	27.54 ± 0.87^{a}	31.00 ± 0.65^{a}
LB	592.37 ± 17.91^{b}	41.05 ± 1.34^{b}	12.41 ± 0.27^{b}	19.68 ± 0.94^{b}	26.86 ± 0.71^{b}
OS	2868.46 ± 61.89^{a}	73.27 ± 0.54^{a}	4.25 ± 0.07^{c}	18.18 ± 0.50^{c}	4.30 ± 0.18^{c}

* *Data are presented as mean value ± standard deviation (n=5); different superscript letters (a, b, c) within same column indicate significant difference between mean values (HSD test, α=0.05).*

The analysis revealed the presence of 36 different polyphenolic components in both traditionally prepared sour cherry liqueurs. Namely, they contained 7 anthocyanins (cyanidin-3-*O*-sophoroside; cyanidin-3-*O*-(2'-glucosyl) rutinoside; cyanidin-3-*O*-glucoside; cyanidin-3-*O*-rutinoside; peonidin-3-*O*-(6'-*p*-coumaroylglucoside) glucoside; peonidin-3-*O*-rutinoside; pelargonidin pentoside), 8 flavonols (kaempferol trihexoside; dihydroxikaempferol dihexoside; quercetin-3-*O*-rutinoside hexoside 1; quercetin-3-*O*-rutinoside hexoside 2; quercetin-3-*O*-rutinoside; quercetin-3-*O*-galactoside; kaempferol-3-*O*-rutinoside; isorhamnetin-3-*O*-rutinoside), 12 flavan-3-ols (procyanidin B1; procyanidin trimer 1; procyanidin B2; procyanidin tetramer 1; epicatechin; procyanidin trimer 2; procyanidin tetramer 2; procyanidin trimer 3; procyanidin tetramer 3; procyanidin dimer 1; procyanidin dimer 2; procyanidin trimer 4), and 9 phenolic acids (dicaffeoylquinic acid 1; dicaffeoylquinic acid 2; 5-caffeoylquinic acid; 3-*O*-*p*-coumaroylquinic acid; 3-caffeoylquinic acid; 4-caffeoylquinic acid; *p*-coumaroylquinic acid 1; *p*-coumaroylquinic acid 2; 3,5-dicaffeoylquinic acid). Generally, the results regarding to polyphenolic profiles are in accordance with the available data for the polyphenols in sour cherries [8], [9], sour cherry wines [10], and sour cherry juice [16], despite some differences due to the used variety of sour cherry, product type, techniques employed for preparation/ processing, and possible differences in the method used for analysis.

However, our both investigated liqueurs had different polyphenolic profiles, and also different from that of the sour cherry fruits, used for liqueur preparation. The contents of total polyphenolics and the relative proportions (%) of each group of polyphenolic components (anthocyanins, flavonols, flavan-3-ols, and phenolic acids) contained in both liqueurs and the sour cherry fruits (OS) are presented in Table 1. The most noticeable are the differences of the anthocyanins proportion. Evidently, anthocyanins were dominant polyphenolic fraction in fresh fruits (73.27%), but their proportions in both liqueurs were significantly lower (20.37% in LA, and 41.05% in LB). These obvious changes certainly contribute to the increase of proportions of other three polyphenolic fractions. The proportions of flavonols were higher in liqueurs compared to the raw material, and the same tendency could be observed for phenolic acids. The proportions of flavan-3-ols in sour cherries (OS) and the liqueur prepared in dark (LB) were insignificantly different (18.18% and 19.68%, respectively), but significantly higher (27.54%) in

the liqueur LA. These differences have shown that the conditions for preparation of liqueurs had strong influence on transformations of polyphenolic compounds, wherein some of them were probably degraded or interacted with other present compounds. Degradation reactions of polyphenols are initiated by the enzymes present in the raw material, and continue in liqueurs during storage in form of non-enzymatic process. On the other hand, polyphenolic compounds undergo polymerization and condensation reactions with other polyphenols [17].

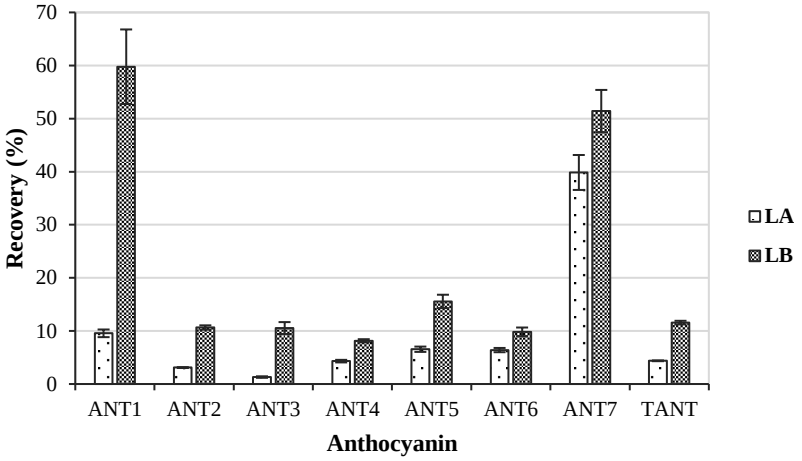

Figure 1. Recovery (%) of identified anthocyanins in the sour cherry liqueurs: cyanidin-3-O-sophoroside (ANT1); cyanidin-3-O-(2'-glucosyl) rutinoside (ANT2); cyanidin-3-O-glucoside (ANT3); cyanidin-3-O-rutinoside (ANT4); peonidin-3-O-(6'-p-coumaroylglucoside) glucoside (ANT5); peonidin-3-O-rutinoside (ANT6); pelargonidin pentoside (ANT7); total anthocyanins (TANT); (data are presented as means ± standard deviation, n=5)

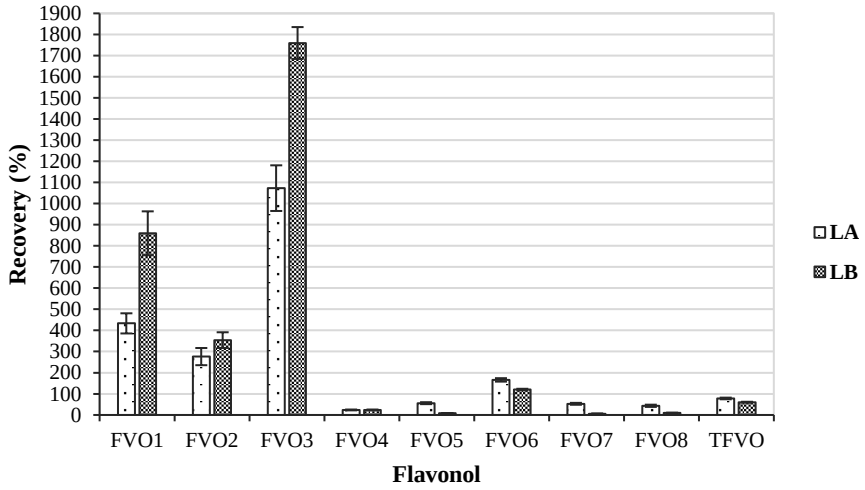

Figure 2. Recovery (%) of identified flavonols in the sour cherry liqueurs: kaempferol trihexoside (FVO1); dihydroxikaempferol dihexoside (FVO2); quercetin-3-O-rutinoside hexoside 1 (FVO3); quercetin-3-O-rutinoside hexoside 2 (FVO4); quercetin-3-O-rutinoside (FVO5); quercetin-3-O-galactoside (FVO6); kaempferol-3-O-rutinoside (FVO7);isorhamnetin-3-O-rutinoside (FVO8); total flavonols (TFVO); (data are presented as means ± standard deviation, n=5)

In order to get a more detailed overview on the polyphenolic profile of investigated sour cherry liqueurs, the recovery of each identified polyphenol regarding the content of respective compound in the raw material was

calculated. The higher content of the particular compound in the liqueurs means the higher percentage of recovery, however recovery value higher than 100% indicated on a higher content in a liqueur compared to the sour cherry fruits. The recovery of anthocyanins ranged between 1.31 and 39.85% for LA liqueur, and 8.14 to 59.77% in LB liqueur, as shown on Figure 1. As it was expected, the recovery of all identified anthocyanins was higher for the liqueur prepared in dark, compared with the liqueur prepared with exposure to sunlight. The highest recovery values had cyanidin-3-*O*-sophoroside (~60%, ANT1) in LB liqueur and pelargonidin pentoside (ANT7) for both liqueurs, and the recovery below 20% was established for the other anthocyanins in both liqueurs. Anthocyanin contents tend to decrease during maceration probably due to the influence of temperature, co-pigmentation reactions and interactions with sugars [18]. The co-pigments could inhibit degradation of anthocyanins when subjected to UV light [19]. Elevated concentrations of ethanol increase the rate of degradation, and in the same time reduce the co-pigmentation leading to decreased anthocyanin stability [20].

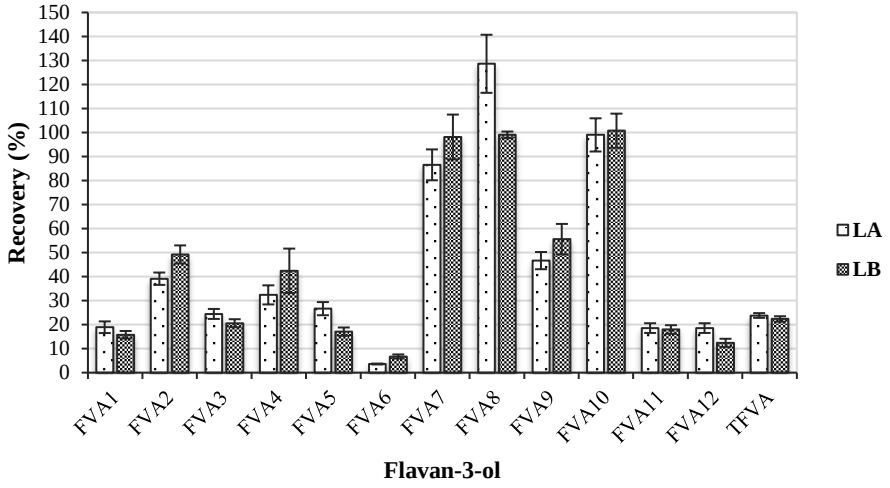

Figure 3. Recovery (%) of identified flavan-3-ols in the sour cherry liqueurs: procyanidin B1 (FVA1); procyanidin trimer 1 (FVA2); procyanidin B2 (FVA3); procyanidin tetramer 1 (FVA4); epicatechin (FVA5); procyanidin trimer 2 (FVA6); procyanidin tetramer 2 (FVA7); procyanidin trimer 3 (FVA8); procyanidin tetramer 3 (FVA9); procyanidin dimer 1 (FVA10); procyanidin dimer 2 (FVA11); procyanidin trimer 4 (FVA12); total flavan-3-ols (TFVA); (data are presented as means ± standard deviation, n=5)

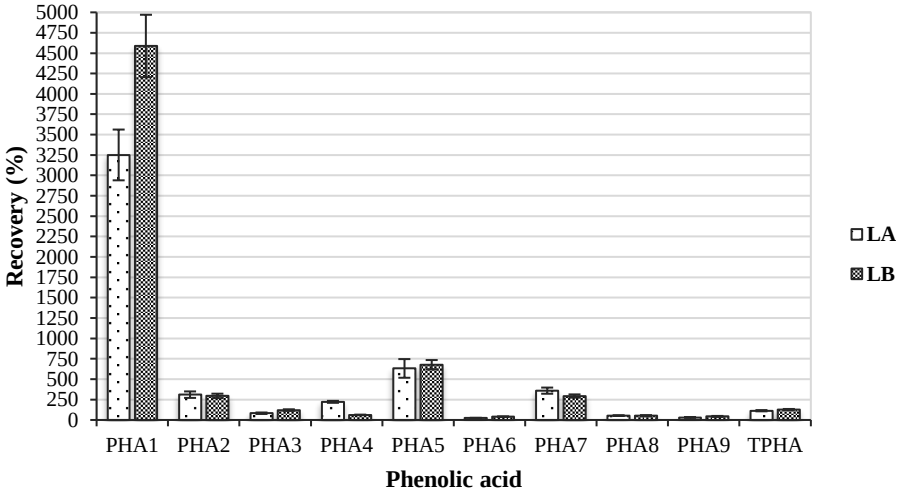

Figure 4. Recovery (%) of identified phenolic acids in the sour cherry liqueurs: dicaffeoylquinic acid 1 (PHA1); dicaffeoylquinic acid 2 (PHA2); 5-caffeoylquinic acid (PHA3); 3-O-p-coumaroylquinic acid

(PHA4); 3-caffeoylquinic acid (PHA5); 4-caffeoylquinic acid (PHA6); p-coumaroylquinic acid 1 (PHA7); p-coumaroylquinic acid 2 (PHA8); 3,5-dicaffeoylquinic acid (PHA9); total phenolic acids (TPHA); (data are presented as means ± standard deviation, n=5)

In contrast to colored phenolics the colorless phenolic compounds were present in higher contents in both liqueurs than in sour cherries. The recovery values for flavonols in the sour cherry liqueurs are presented on Figure 2. Noticeably high recovery percentage had quercetin-3-*O*-galactoside (FVO6), dihydroxikaempferol dihexoside (FVO2), kaempferol trihexoside (FVO1), and particularly the quercetin-3-*O*-rutinoside hexoside 1 (FVO3). The remaining 4 flavonol compounds were significantly less recovered, 23.77-55.84% in the liqueur prepared with sunlight exposure (LA), and 6-24.05% for the liqueur where maceration was performed in dark (LB). In addition, the recovery values were greater for LB liqueur than for the LA liqueur.

On the other hand, the colorless flavan-3-ols, except procyanidin trimer 3 (FVA8) in LA liqueur, had recovery values up to 100% (Figure 3). The procyanidin B1 (FVA1), procyanidin B2 (FVA3), epicatechin (FVA5) and procyanidin trimer 4 (FVA12) showed a higher level of recovery in LA liqueur (prepared on sunlight), compared with the LB liqueur (prepared with maceration in dark). In regards to phenolic acids it is characteristic that 5 components had a very high recovery in both liqueurs (Figure 4). For the liqueur prepared by maceration on sunlight (LA) dicaffeoylqunic acid 2 (PHA2), 3-*O*-*p*-coumaroylquinic acid (PHA4) and *p*-coumaroylquinic acid 1 (PHA7) had higher percentage of recovery than in liqueur prepared by maceration in dark conditions (LB). But, dicaffeoylquinic acid 1 (PHA1), 5-caffeoylquinic acid (PHA3) and 3-caffeoylquinic acid (PHA5) had greater recovery in LB liqueur compared to LA liqueur.

These findings clearly indicate the possible transformations of the present compounds in liqueurs during the maceration and aging towards formation of some of the identified polyphenols. But the fact that the liqueurs were prepared with maceration of whole sour cherry fruits (without pitting), indisputably suggest that stones contributed to polyphenolic profiles of these beverages. Sweet cherry stones are reach sources of flavonols, flavanols, flavones, flavanones and hydroxycinnamic acids, and their extraction depend on used water/organic solvent proportion. So, for example quercetin glycosides are more soluble in organic solvents which is one of the reason for being among the most abundant components in the liqueurs [21]. The content of flavanols is related with their participation in polymerization reactions that occur during maceration process, and the used extraction medium [15]. It was found that during the aging of wines in bottles the contents of hydroxycinnamic acids increased, process associated with disappearance of the anthocyanins, especially *p*-coumaroyl derivates [22].

4. CONCLUSIONS

This study is a contribution to the even more raising interest for traditional foods. The presence of 36 different polyphenolic compounds in sour cherry liqueurs prepared in two different traditional ways was confirmed. A strong influence over polyphenolic profiles had the processing conditions. Liqueur prepared in dark during the maceration had more favorable polyphenolic contents and overall higher recoveries of polyphenolics, compared to the liqueur prepared with exposure to direct sunlight. Anthocyanins fraction was dominant in LB liqueur, and its proportion was 50% higher than in LA liqueur. The colorless polyphenolic fractions (flavonols, flavan-3-ols, and phenolic acids) are more prevalent in the both liqueurs, compared to the raw material. In further investigation the evolution of polyphenolic profiles during maceration and aging should be evaluated, as well as the antioxidant capacity of the liqueurs.

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Effects of Nutrition Education on General Health and Nutrition Status of Pregnant Women

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Abstract

Nutrition education improves maternal nutrition and reduces the risk of poor health outcomes in both mothers and their children. The relationship between maternal nutrition education and mother's nutritional knowledge score, dietary habits, food consumption and health status (hemoglobin, hematocrit, blood pressure and body weight gain) were the subject of investigation in this study. This study has been conducted by random sampling on 150 low income pregnant women between the ages of 18-35, in intervention and control groups. Data was collected at an initial interview and again at a final interview after two nutrition education programs.There were significant increases in the nutritional knowledge score and mean intake of calcium, iron, vitamin A and weight gain in the intervention group ($p<0.05$),also increases on mean intake of energy, protein and vitamin C. Hemoglobin and hematocrit levels in the intervention group did not appear to be influenced by the nutrition education. The results indicate that nutrition counseling during pregnancy can improve dietary intake and maternal weight gain.

Key words

Nutrition, Nutritional education, Pregnant

1. INTRODUCTION

Optimal maternal nutrition during pregnancy and lactation is vitally important to the health of mother and infant. Nutritional needs rise during pregnancy in response to the metabolic demand of the developing embryo as well as to changes in maternal physiology [1]. An association exists between health of fetus and adequate and balanced maternal nutrition during pregnancy, which is a natural event for every woman [2]. The nutritional status of the mothers in pre and postnatal periods is of great importance for the health of both the mother and their unborn babies thus maternal nutrition becomes a strong underlying determinant for the public health. The pre- and early postnatal phases are the periods during which changes to nutritional status may have the most detrimental impact. Furthermore, a large evidence base confirms that direct effects of maternal nutritional status on offspring adult health can occur. If birth weight and intrauterine growth restriction are assumed as proxy indicators for maternal nutrient supply [3].

When the maternal nutrition is inadequate and unbalanced during gestational period, the baby's needs are provided from the own tissues of mother. The risk incurred by the mother due to inadequate and unbalanced nutrition increases with the poor socio-economic and health conditions. If the increased energy and nutrient requirements are not met, various diseases, especially anemia, osteomalacia and decreased resistance to infection can occur in the mother. In addition, the incidence of complications in pregnancy and birth increases 3-4 folds [1,2,3,4]. There is a strong association between low birth weight and intrauterine growth restriction, and later: insulin metabolism; T2DM; central adiposity; abnormal lipid metabolism; obesity; hypertension; cardiovascular diseases (CVD); increased risk of death from ischaemic heart disease; and renal disease [5]. The malnutrition

due to inadequate and unbalanced nutrition during gestation has extremely important negative effects of on intrauterine growth. Stillbirth, preterm birth and low birth weight are among commonly encountered problems [2].

Maternal diet during this period is an important criterion for the outcome of the pregnancy. Daily energy and nutrient items for pregnant women and nursing mothers should individually be planned to meet their physiological requirements, to keep the nutrition stores in balance, to ensure normal growth and development of the fetus and to ensure adequate milk secretion during lactation [1, 4].

When maternal weight gain is insufficient during pregnancy, the risk of low birth weight is increased; therefore, diet should be managed to ensure that energy intake is neither excessive nor deficient. Energy and nutrient requirements of pregnant and lactating women are higher than normal women. Physiologic changes during pregnancy alter nutritional requirements. Plasma volume expands nearly 50% during pregnancy. Total mass of red blood cells increases about 33% over pre-pregnancy levels. Basal metabolic rate is increased by 15% to 20% toward the end of gestation. These changes require increased intake of energy, nutrients, and fluid [1].

Studies conducted in our country have revealed that the majority of pregnant women change the nutritional habits during gestation, but that is not in the desired manner, i.e. in accordance with adequate and balanced nutrition principles. It has been indicated that malnutrition problems are due to lack knowledge rather than economic difficulties .Unfortunately, in our country, correct and effective nutrition education services during pregnancy cannot be provided to a large portion of this risk group. Since the increasing the awareness of pregnant women for nutrition during gestation and lactation is of importance for achieving healthy generations, this study was performed to determine the influence of the nutrition education given to pregnant women with different frequencies at different stages of gestation on the nutritional status and overall health status in comparison with the pregnant women receiving no education [6].

The relationship between maternal nutrition education and mother's nutritional knowledge score, dietary habits, food consumption and health status (hemoglobin, hematocrit, blood pressure and body weight gain) were the subject of investigation in this study.

2. MATERIAL AND METHODS

This experimental and investigation study was initiated with the permission of Ministry of Health. All participants provided written in formed consent.

2.1. Participant and Study Design

This study was started with 173 pregnant women giving maximum two live births or less and aged between 18-35 who admitted to Pregnancy Clinic of Maternal and Child Health and Family Planning Center located in Çubuk, Ankara. However, the study has been completed with 150 pregnant volunteers because the 2 women had abortion during the first trimester of pregnancy and, authors could not reached gain to 21 pregnant women after the first interview. The women with chronic diseases such as renal, thyroid, cardiovascular problems and diabetes were excluded from the study.

One hundred and fifty pregnant volunteer women whose gestational age determined according to the last menstrual period were equally divided into six groups as controls and treatments containing 25 participants in each. Group 1 consisted of the participants at their first trimester (in 1-3 months) of pregnancy, Group 2 consisted of the participants at their second trimester (in 4-6 months) of the pregnancy and Group 3 consisted of the pregnant women who were at the third trimester (in 7-9 months) of pregnancy. A control was kept for each group.

2.2. Data Collection and Measurements

A questionnaire consisting of questions that are designed to determine the women's personal information (age, age at marriage, pregnancy history, education and occupation, etc.), nutrition knowledge and dietary behaviors during pregnancy as well as daily food consumption, frequency food intake physical activity status, general health status and awareness of breastfeeding was administered

to the participants. Each question was scored as one point. Total score was 38. The scores of 0-12, 13-25 and 26-38 were classified as poor, medium and good respectively.

Heights and weights of pregnant women were measured at the beginning of the study. The measurements were repeated at each meeting in order to determine the weight gain. Weight and height were measured according to the technique by researchers in the clinical scales. The records related to edema, blood pressure, blood and urine tests were obtained from the personal file of participants after the examination by the clinician and nurses. Women's hemoglobin and hematocrit levels were determined with a hematocrit centrifuge by laboratory technician in the center. Dietary intake and physical activity were obtained by the method of keeping a daily record.

Gram values corresponding to practical measures were used to determine the amount of food consumed by the participants [7]. Energy and nutrient values for these nutrients were calculated using food composition tables. The amount of nutrients in a serving of the food consumed by participants was calculated according to the Standards Food Recipes for Institutions [8].

Women in Group 1 were trained twice at their first and second trimesters of pregnancy until the end of pregnancy. Only one nutrition education was given to women in the Group 2 (second trimester) and Group 3 (third-trimester). Pregnant women in the treatment groups were trained face to face for the issues of the impact of the pregnant nutrition on maternal and infant health, food groups, and the amount of the essential nutrients to be consumed during pregnancy, weight gain in pregnancy, iodized salt utilization, protection from anemia and the importance of food preparation and breast-feeding. An illustrated guide prepared for pregnant women was used in education, and a brochure containing the issues given during education was provided to each participant following the training. The same questionnaire was repeated again within 30 days for every woman to detect the changes after nutrition education.

In this study, there are some limitations. First, we studied the small sample size. Large-scale studies are needed on this issue in the future studies. Second, self-reported dietary intake data are likely inaccurate.

2.3. Analysis of Data

Data were analyzed by the Statistical Package for Social Science version 16.0 software (SPSS, Chicago, IL.USA). Kruskal Wallis variance analysis for the differences between groups, Mann-Whitney U test, the Wilcoxon two-sample paired signed rank test for analysis of repeated measurements and Chi square tests for independent variables were performed. When the differences were significant, Bonferroni correction was performed to determine which subgroups are different. The relationship between variables was evaluated with Spearman correlation analysis. P values less than 0.05 were considered as significant [9].

3. RESULTS AND DISCUSSION

All of the pregnant women participating in the study were housewife and the majority of them was primary school graduates. The mean age of the women at first pregnancy were between 19.28 and 20.32. The time between two pregnancies was longer than the required limit of 24 months in the great majority of women participated in the study. The 16% of the women had consanguineous marriages and the percentage of the families living with their parentswere high. Most of the women had routine controls every month and had been examined by a midwife or nurse. The pre-pregnancy BMI (body mass index) of the women was within normal limits. Lack of obesity before pregnancy in the presented study, compare to overall BMI in Turkey, may be due to the lower age of the women participating in the study (Table 1).

Appropriate weight gain during pregnancy is directly related to the baby's birth weight. For women with a baseline BMI below 20, weight gain of 0.5 kg per week during the second and third trimesters is indicated. For overweight women (BMI of 25 to 29.9), weight gain of 0.3 kg per week during the same period is recommended. [10]. Weight gain of more than 1 kg per week at any time is generally excessive [1]. The recommended average weight gains in pregnancy were 0.065 kg/week for 0-10th weeks, 0,335 kg/week for 10-20th weeks, 0.45 kg/week for 20-30th weeks and 0.335 kg/week for 30-40 weeks [11a]. In this study, although, total weight gain of pregnant women varied in each trimester, they gained 12.5 kg ± 10 % (9 -14 kg) weight totally, approximately 1-1.5 kg per month. Observation of higher ($p < 0.05$) weekly weight gain in women who trained and monitored from the beginning to the termination of the gestation as Ziegleranf Filerj's recommended (Table 1) [11].

Strychar et al. (2000) who investigated the effects of psychosocial and lifestyle factors on weight gain of 115 pregnant women during pregnancy, and reported that being under doctor or dietician control improves the weight gain. These authors also observed that women gained insufficient weight when they smoked more but controlled less by clinician or dietitian as well as have less knowledge about weight gain during pregnancy [12].

Antenatal care is one of the most important preventive healthcare and support providing regular check-ups by doctors or midwives for mother and unborn baby [13]. Although, the timing and number of antenatal visits depends on the individual, pregnant women should be monitored by health professionals at least four times [14a].

The physical examination of pregnant women is performed, blood pressure is taken and height and weight are measured, and if it is in accordance with the vaccination calendar, they are vaccinated against tetanus, and education related to pregnancy, labor and the baby is given during routine follow-up. However, a standard training for the principles of nutrition during pregnancy is not included in these applications. Even, medical staffs who have limited nutrition knowledge cannot give enough nutrition education to women. In the presented study, most of the women visited the clinics every month (88% 84%, 84%, 44%, 80%, 76% respectively) and underwent routine examinations (76% 56%, 64%, 48%, 60 %, 52 % respectively).

Maternal anaemia is associated with mortality and morbidity in the mother and baby, including risk of miscarriages, stillbirths, prematurity and low birth weight [15]. 32.4 million pregnant women with anaemia and 0.8 million pregnant women had severe anaemia worldwide in 2011 [16]. Maternal anemia remains a significant health problem specially in low and middle-income countries. Rahman et al (2016) conducted a systematic review and meta-analysis to estimate the pooled prevalence of anemia, the association between maternal anemia and pregnancy outcomes. There were significantly higher risks of low birth weight (12%), preterm birth (19%), and perinatal mortality (18%), in pregnant women with anemia in low- and middle-income countries [17].

Anemia is a major public health problem that still preserves the severity in Turkey. In a study investigating the maternal deaths and their causes, it has been demonstrated that anemia is responsible for 3.7% all of maternal deaths in Turkey [18]. In a survey conducted by the Ministry of Health, 54.7% of mothers receiving at least one diagnosis of anemia during their lives and 46.6% of the mothers (anemia diagnosed in 85.2% of mothers) had this diagnosis during pregnancy [19]. Birth and excess number of pregnancies, short pregnancy intervals, malnutrition, recurrent infections and blood losses due to miscarriages and unhealthy deliveries are the leading factors of anemia seen in pregnancy [20].

In the presented study, decreases were observed in hemoglobin and hematocrit levels of all of the women in the experimental and control groups in every trimesters. However, more pronounced decreases in hemoglobin levels were determined, particularly, in the second and third interviews after the second trimester (Table 2). In the last interviews, the percentages of the women with hemoglobin level lower than 11 g/dL were found as 64%, 60%, 72%, 64%, 68% and 60% respectively.

In another study conducted on 320 pregnant women determined the prevalence of anemia in pregnant women in Afyon province and the factors that affect anemia in order to attract the attention of public to this issue, and found the prevalence of anemia as 29.38 % in pregnant women by considering the hemoglobin values. The author reported that 17.65% of pregnant women with anemia were at first trimester, 32.48 % of them were at second trimester and remaining 32.59 % were at third trimester which indicates high prevalence, thus emphasized that the priority should be diverted to the education and service delivery [21]. In another survey conducted on the pregnant women admitted to Güzelbahçe Health Center, İzmir where located in western part of Turkey, the Hb level lower than 10.5 g/dL was accepted as anemic. The 28.9 % of the women was found anemic and the 75% anemia was due to iron deficiency. It has been shown that the risk of anemia increased by 2.8 fold in second trimester and 4.2 fold in third trimester. The 67 % of pregnant women used iron and folic acid pills with a doctor's recommendation during that survey, and no significant effect of the use of iron and folic acid on anemia in pregnant women was reported [22].

Dietary factors play a major role in the development of the anemia. Therefore, dietary nutrition education should be a good first step in preventing anemia depending on nutritional insufficiency. In our study no significant correlation was determined between nutrition knowledge and hemoglobin and hematocrit levels of the women. Lack of significant correlation between women's nutrition knowledge and hemoglobin and hematocrit levels in this study may be due to several variables affecting hemoglobin and hematocrit levels.

Education has always been a perennial process since the dawn of mankind. It can be said that in any situation where learning occurs educational process changes human behavior. Education is defined as the process forming desired changes in behaviors of individuals that occurs as a result of their experiences [23]. Nutrition education

is not only an important factor in the development of healthy families and communities, but also, in some manner, it helps to improve the nutritional status of women and children, and contribute to overcome the health problems such as chronic diseases, maternal mortality, infant and child deaths, which are still striking problems in our country. Nutrition education is one of the most important preventive health services.

It has been reported that the ultimate goal of nutrition education is to produce nutritionally literate decision makers who are motivated, knowledgeable, skilled, and willing to choose proper nutrition alternatives [24]. The lack of nutrition knowledge of families is one of the prime causes of malnutrition seen particularly in children and pregnant women. Although many families have enough food in various types in their homes, they cannot use them in accordance with the principles of nutrition. In the presented study, after every call, an increase was observed in nutrition knowledge status of women who received nutrition education. The increase in the awareness was the highest at all trimesters in the women who were monitored and trained nutrition starting from the first trimester. In this group, the scores were 15.4, 23.4 and 27.6 for the first, second and third trimesters respectively. Likewise, in this group, the number of wrong answers after each training was low, which was followed by the women who received education at second trimester and the highest wrong answers were given by the women who received education only at third trimester with the scores of 11.1, 10.1 and 7.6 for the first, second and third trimesters respectively ($p<0.05$) (Table 3).

Considering the questions for assessing the nutritional behavior of women, the highest number of correct answers for use of iodized salt, preparation and cooking the food and oil use was observed in women who received education. Compare to treatment Groups 2 and 3; higher rates of correct answers were determined in the treatment Group 1 for the questions such as what should be the first food for baby, when breast milk should be given for the first time after the birth . At the beginning of the study, the rates of correct answers given to the question searching the month of additional food was lower (32%, 32%, 44%, 48%, 20%, 52% respectively). But education increased the correct answer rates markedly in the experimental groups (80%, 36%, 60 %, 56%, 60%, 40% respectively). Different responses were obtained from the participants concerning the time of first nutritional supplement to be taken. Rice flour-starch foods, milk and fruit juice had been preferred before the training whereas priority was given to milk and yogurt after the education.

Women in all experimental groups consumed the recommended nutrients, such as milk, yogurt, eggs, vegetables and fruit, more frequently than the women in the corresponding controls after the nutrition education with more pronounced increase in the experimental Group 1. Significant differences were determined between the interviews concerning the calcium, iron and vitamin A intake of the participants in the Group 1 and its control group (Control 1) ($p<0.05$) based on a daily dietary intake that was calculated from the energy and nutrient items coming from the consumption of food during a day. After the training, women in the experimental groups consumed these nutrients more than before the nutrition education. Energy, protein and vitamin C consumption levels were also increased in women in the experimental groups after training. An increase was observed in the consumption of food items of women in the Grou+p 2 in the next meeting after the education ($p<0.05$). The increase only in vitamin A was significant ($p <0.05$) in the Control Group 2 (Table 4). Women receiving nutrition education at their third trimester consumed more energy and protein but decreases were observed in calcium, vitamin A and C intake ($p<0.05$). Declined energy, calcium and riboflavin intake in the corresponding controls at the last meeting (Control 3), may indicate that nutritional education in the last months of pregnancy is not very effective in the food intake.

4. CONCLUSIONS

The results of the presented study have revealed that the knowledge of pregnant women in the rural area concerning the nutrition during pregnancy and anemia is insufficient which may lead the development of anemia and/or adversely affect the course of anemia. However, the desired level of nutrition education cannot be provided to most of the pregnant women who constitute an important risk group in our country. Therefore, providing nutrition education to the pregnant women is of paramount importance for the health of mother and unborn baby for creating healthier generation. In addition, determining nutrition policy and inserting it into routine health services for preventing nutritional problems in pregnancy as well as the implementation of comprehensive prenatal care and follow-up program and training of prenatal care staff by giving an effective nutrition education is a necessity in our country. The observation of very common and severe anemia in our country highlights the need of large-scale surveys. The importance of nutrition during pregnancy and breastfeeding emphasizes that the necessary precautions, such as iron and folate supplements in addition to dietary modification, should be taken for preventing the vitamin and mineral deficiencies.

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Empirical Analysis on the Running Time of a Searching Algorithm, Chunk Algorithm

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Abstract

Searching and sorting, by no doubt, represent two of the most fundamental and widely encountered problems in computer science. Given a collection of objects, the goal of search is to find a particular object in this collection or to recognize that the object does not exist in the collection. A major goal of computer sciences is to understand and develop a solution for the particular problem. Typically solving the problem involves at least four steps: (1) design an algorithm, (2) analyze the correctness and efficiency of the procedure, (3) implement that procedure in some programming language, and (4) test that implementation. An important issue is to describe the efficiency of a given procedure for solving a problem. Informally, usually we speak in terms of "fast" or "slow" programs, but the absolute execution time of an algorithm depends on many factors such as: the size of the input, the programming language used to implement the algorithm, the quality of the implementation and the machine on which the code is run (a supercomputer is faster than a laptop). In this paper we will analyze the performances of a searching algorithm, precisely the chunk algorithm. In analyzing the efficiency of chunk algorithm, we will only concentrate on searching items, using the Chunk-Search Algorithm, on one-dimensional arrays with integers. We wanted to see how does different chunk size, input size (i.e., the "speed" of the algorithm as a function of the size of the input on which it is run), and the machine on which the code is run.

Key words

Chunk algorithm, computer performance, input size, chunk size

1. INTRODUCTION

There are some very common problems that we use computers to solve: searching through a lot of records for a specific record or set of records and sorting, or placing records in a desired order. At times we need to use both of these techniques as part of solving the same problem. There are numerous algorithms to perform searches and sorts.

A question you should always ask when selecting a search algorithm is "How fast does the search have to be?" The reason is that, in general, the faster the algorithm is, the more complex it is.

The concept of efficiency (or complexity) is important when comparing algorithms. For long lists and tasks, like searching, that are repeated frequently, the choice among alternative algorithms becomes important because they may differ in efficiency.

Before we can compare different methods of searching we need to think a bit about the time requirements for the algorithm to complete its task. We could also compare algorithms by the amount of memory needed.

An algorithm can require different times to solve different problems of the same size (a measure of efficiency). For example, the time it takes an algorithm to search for the integer '1' in an array of 100 integers depends on the nature of the array.

How can one describe the efficiency of a given procedure for solving some problem? Informally, one often speaks of "fast" or "slow" programs, but the absolute execution time of an algorithm depends on many factors:

- the size of the input (searching through a list of length 1,000 takes longer than searching through a list of length 10),
- the algorithm used to solve the problem (Unordered-Linear-Search is inherently slower than Binary-Search),
- the programming language used to implement the algorithm (interpreted languages such as Basic are typically slower than compiled languages such as C++),
- the quality of the actual implementation (good, tight code can be much faster than poor, sloppy code), and
- the machine on which the code is run (a supercomputer is faster than a laptop).

In analyzing the efficiency of an algorithm, one typically focuses on the first two of these factors i.e., the "speed" of the algorithm as a function of the input size and the machine on which it is run. Finally, when analyzing the efficiency of an algorithm, one often performs a worst case and/or an average case analysis.

A worst case analysis aims to determine the slowest possible execution time for an algorithm. For example, if one were searching through a list, then in the worst case, one might have to go through the entire list to find (or not find) the object in question. A worst case analysis is useful because it tells you that no matter what, the running time of the algorithm cannot be slower than the bound derived. An algorithm with a "good" worst case running time will always be "fast." On the other hand, an average case analysis aims to determine how fast an algorithm is "on average" for a "typical" input. It may be the case that the worst case running time of an algorithm is quite slow, but in reality, for "typical" inputs, the algorithm is much faster: in this case, the "average case" running time of the algorithm may be much better than the "worst case" running time, and it may better reflect "typical" performance.

Average case analyses are usually much more difficult than worst case analyses. In actual practice, the average case running time of an algorithm is usually only a constant factor (often just 2) faster than the worst case running time. Since worst case analyses are (1) interesting in their own right, (2) easier to perform than average case analyses, and (3) often indicative of average case performance, worst case analyses tend to be performed most often.

With this as motivation, we now analyze the performances of the algorithm Chunk-Search.

2. A REVIEW OF THE CHUNK-SEARCH ALGORITHM

Given an ordered list, one need not (and one typically does not) search through the entire collection one-by-one. Consider searching for a name in a phone book or looking for a particular exam in a sorted pile: one might naturally grab 50 or more pages at a time from the phone book or 10 or more exams at a time from the pile to quickly determine the 50 page (or 10 exam) "chunk" in which the desired data lies. One could then carefully search through this chunk using an ordered linear search. Let c be the chunk size used (e.g., 50 pages or 10 exams), and assume that we have access to a slightly generalized algorithm for ordered linear search, Encoding the above ideas; we have the chunk search algorithm [2].

Input: ordered objects array A, the number of objects n, chunk size c, key value being sought x.

Output: if found, return position i, if not, return message "x not found"

a. Cut array A into chunks of size c.
b. Compare x with the last elements of each chunk, except the last chunk! See if x is GREATER than that element.
c. If yes, check the next chunk
d. If no, that means x should be in that chunk
e. Execute Ordered Linear Search inside the chunk

A pseudo code for the algorithm chunk-search is as below:

```
Chunk-Search [A, n, c, x]
        high ← c
        while high < n and A[high] < x
        do high ← high + c
        high ← min{high, n}
        low ← max{high − c + 1, 1}
return Ordered-Linear-Search[A, low , high, x]
```

The call to Ordered-Linear-Search will be performed on a list whose size is at most c, and thus at most 2c additional comparisons will be performed (as described above). We therefore have

$$T(n) = n/c + 2c. \quad [1]$$

Note that the running time of Chunk-Search depends on both n and c. What does this analysis tell us? We can use this analysis, and specifically equation [1], in order to determine the optimal chunk size c; i.e., the chunk size which would minimize the overall running time of Chunk-Search (in the worst case).

Suppose that one were to run Chunk-Search using a very small value of c. Our chunks would be small, so there would be lots of chunks. Much of the time would be spent trying to find the right chunk.

Consider the extreme case of c = 1: in the worst case, n/c = n/1 = n comparisons would be spent trying to find the right chunk while only 2c = 2 compares would be spent searching within a chunk for a total of n + 2 compares (in the worst case). This is worse than Ordered-Linear-Search (though it is still linear)[1].

Now consider using a very large value of c. Our chunks would be big, so there would be few of them, and very few comparisons would be spent finding the right chunk. However, searching for the element in question within a very large chunk would require many comparisons. Consider the extreme case of c = n: in the worst case, n/c = n/n = 1 comparison would be spent "finding" the right chunk (our chunk is the entire list) while 2c=2n compares would be spent searching within a chunk for a total of 2n + 1 compares (in the worst case). This is worse than either Unordered-Linear-Search or Ordered-Linear-Search (though, again, it is still linear).

Is Chunk-Search doomed to be no faster than linear search? No! One must optimize the value of c in order to minimize the total number of comparisons, and this can be accomplished by choosing a value of c which balances the time (number of comparisons) spent finding the right chunk and the time spent searching within that chunk. Suppose that we wish to spend precisely equal amounts of time searching for the correct chunk and then searching within that chunk; what value of c should we pick? Our goal is then to find a c such that n/c (the time spent searching for a chunk) is equal to 2c (the time spent searching within a chunk)[4].

$$n/c = 2c$$
$$n = 2c^2$$
$$n/2 = c^2$$
$$c = \sqrt{n/2}$$

Thus for $c = \sqrt{n/2}$

$$T(n) = \frac{n}{c} + 2c = 2\sqrt{2n}$$

By this we answer the above question that for n/c = 2c, T(n) is optimized

Note that for sufficiently large n, this is much faster than a linear search. For example, if n=1,000,000, Ordered-Linear-Search would require 2,000,000 comparisons in the worst case, while Chunk-Search would require approximately 2,828 comparisons in the worst case— Chunk-Search would be approximately 707 times faster (in the worst case).

Do even better values of c exist? One can show through the use of calculus that $c = \sqrt{n/2}$ is optimal. We essentially have a function (n/c + 2c) which we wish to minimize with respect to c. Taking the derivative with respect to c, setting this derivative to zero, and solving for c yields $c = \sqrt{n/2}$.

3. RESULTS AND DISCUSSION

In this study we will only concentrate on searching items, using the Chunk-Search Algorithm, on one-dimensional arrays with integers. We wanted to see how does different

- chunk size, input size, and hardware (computers)

  influence the speed.

The tests were run in computers with different characteristics:

1. **CPU: Intel(R) Core (TM) i3 2.2 GHz, 6 GB RAM (PC1)**
2. **CPU: Intel® Core™ i7-4720HQ CPU @ 2.60GHz; 8,00 GB RAM (PC2)**

In order to test the speed of different input size, chunk size and different computer performances, we made a C++ program which runs Chunk-Search Algorithm several times for randomly-generated arrays of different size: 10000, 20000, 30000, 40000, 50000, 60000, 70000, 80000, 90000 and 100000 items (integers). Measurements for the Chunk-Search algorithm, where the array will be divided into chunk size of **c = 1, c = 50, c = 100, c = 250, c = 500, c = 750, c = 1000**

The first experiment was conducted for different sizes of chunks, on different array size. Below are shown results

Table 1. The execution time for Chunk-Search algorithm, for different chunk and array size

	Input size/chunk size	c=1	c=50	c=100	c=250	c=500	c=750	c=1000
PC 1	10000	0.027	0.031	0.055	0.054	0.053	0.031	0.030
PC 2		**0.008**	**0.004**	**0.008**	**0.005**	**0.006**	**0.008**	**0.004**
PC 1	50000	0.037	0.026	0.056	0.054	0.057	0.025	0.028
PC 2		**0.011**	**0.012**	**0.011**	**0.012**	**0.028**	**0.008**	**0.012**
PC 1	75000	0.033	0.035	0.032	0.027	0.028	0.018	0.025
PC 2		**0.012**	**0.012**	**0.012**	**0.012**	**0.009**	**0.021**	**0.009**
PC 1	100000	0.017	0.019	0.021	0.027	0.015	0.012	0.018
PC 2		**0.015**	**0.012**	**0.012**	**0.008**	**0.008**	**0.012**	**0.013**

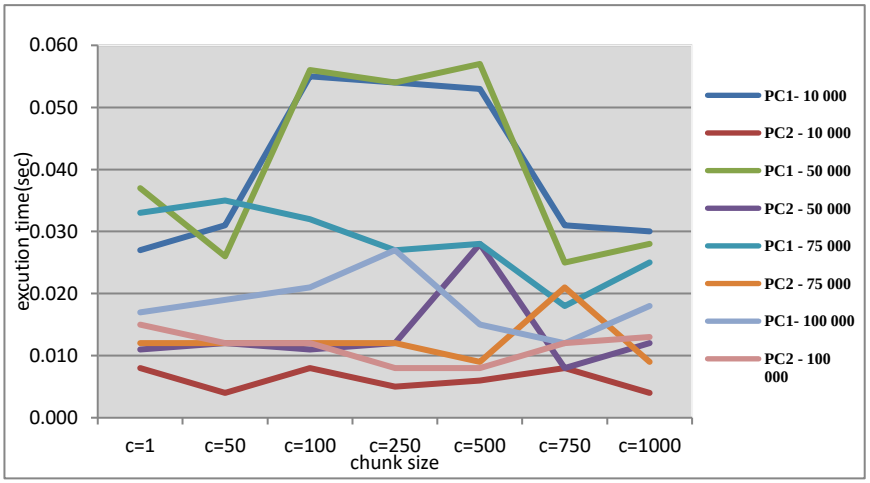

Figure 1. The graph for the Chunk-Search algorithm for different chunk and array size

The second experiment was conducted for different input size, for the chunk size which presents an optimum, **c = 1000**

Table 2. The execution time for the Chunk-Search algorithm to chunk size of 1000.

no. of elements in the array	no. of blocks	exec. time (PC 1) c=1000	exec. time (PC 2) c=1000
10 000	10	0.024	0.006
20 000	20	0.038	0.013
30 000	30	0.039	0.011
40 000	40	0.039	0.012
50 000	50	0.038	0.011
60 000	60	0.039	0.01
70 000	70	0.040	0.01
80 000	80	0.026	0.011
90 000	90	0.022	0.012
100 000	100	0.020	0.009

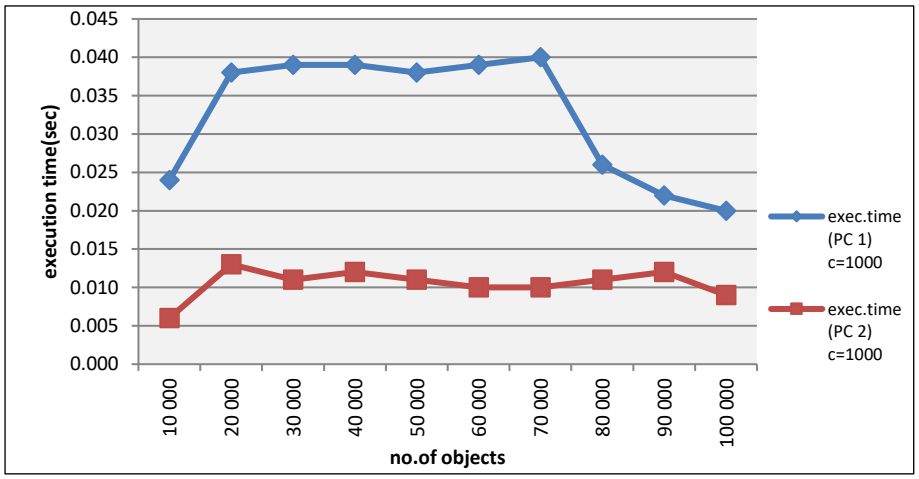

Figure 2. The graph for Chunk-Search algorithm to chunk size of 1000

The third experiment was conducted for different computer performances for the chunk size **c=100**:

Table 3. The execution time for the Chunk-Search algorithm to chunk size of 100

no. of elements in the array	no.of blocks	exec.time (PC 1) c=100	exec.time (PC 2) c=100
10 000	100	**0.029**	**0.007**
20 000	200	**0.054**	**0.015**
30 000	300	**0.053**	**0.010**
40 000	400	**0.048**	**0.010**
50 000	500	**0.038**	**0.010**
60 000	600	**0.032**	**0.011**
70 000	700	**0.020**	**0.009**
80 000	800	**0.018**	**0.011**
90 000	900	**0.018**	**0.011**
100 000	1 000	**0.019**	**0.010**

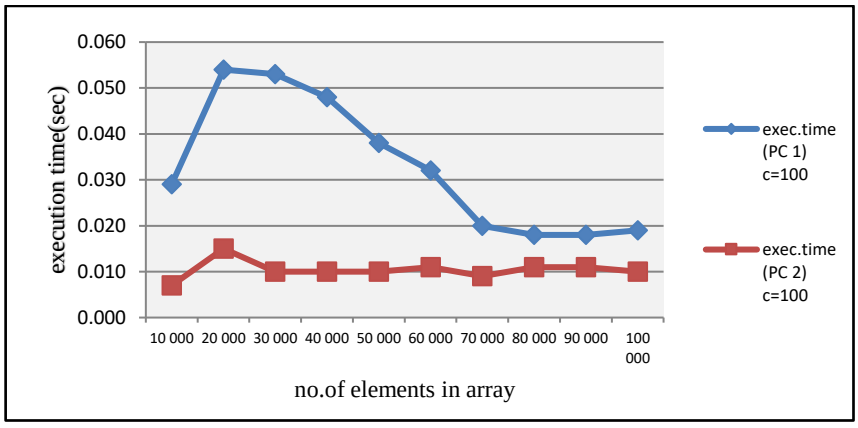

Figure 3. The graph for Chunk-Search algorithm to chunk size of 100

From the first experiment, the case 1, with the chunk size of 1, tab 1. and the fig 1., we see that with increasing of the input size, the overall execution time increases. Similarly to case 1 but with small change are the case 2. For the second case, where the chunk size is 1000, it is seen that with the increasing of the input size from 10000 to 50000 the execution time increases, and then decreases, tab.2 and fig.2. Similarly happens with the third case, where the chunk size is 100, tab.3. and fig.3.

From the empirical analysis of the algorithm and from the experimental one we can conclude that Chunk-Search algorithm has the fastest time in the cases when the chunk size is approximately equal to the number of elements in the input array. The best can be seen in the third case where the chunk size is 100 and the number of elements in the input array is

10000, where each chunk has 100 elements. So, in this case the execution time is 0.007 seconds, which is an optimal time or we can say that the algorithm performs the best.

In the third case it is also was analyzed and compared the algorithm Chunk-Search on two different computers with the different performances as regarding the CPU speed and memory capacity. Analyses were conducted for the chunk size of 100. The best is seen from table and graph above, tab.3 and fig.3, therefore, the execution time varies depending on the speed of the computer, which is with no doubt one of the factors that affect the speed of the algorithm.

4. CONCLUSIONS

From the results derived, shown in the above tables and graphs, and from the empirical analysis of algorithm Chunk-Search is seen that the execution speed of this algorithm is directly affected by the chunk size and the machine performances.

As it is shown empirically we get the optimum in the case when the chunk size and the input size $c = \sqrt{n/2}$. Also it is very clear from the third experiment that the performances of the machine affect the speed of algorithm, as the computers with the best performances suggest that the algorithm will be faster and vice versa.

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Assessment of Fruit and Some Biochemical Characteristics of Almond Genotypes Selected From Natural Populations of Kayseri Province

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Abstract

Almond (*Prunus amygdalus* L.) can grow under dry climate and harsh soil conditions. The fruits are drupe. Seed-propagated almond populations exist in various parts of Turkey. Several studies have been performed to select the promising genotypes among these populations with regard to fruit quality, yield, late foliations and etc. characteristics. Rich almond populations are shown around the foothills of Erciyes Mountain in Kayseri province of Central Anatolia. In this study, some fruit and biochemical characteristics of 34 almond genotypes selected as promising genotypes with regard to late foliation and yield were determined. Significant variations ($P < 0.05$) were observed in investigated traits of the genotypes. Of selected genotypes, fruit weights varied between 1.5±0.4- 7.6±0.5 g, fruit lengths between 40.7±0.7 - 19.9±2.9 mm, fruit heights between 17.4±0.8 – 10.3±2.1 mm and fruit widths between 27.6±0.7 – 11.8±0.7 mm. With regard to fruit shape of genotypes, 13 were identified as long oval, 12 as elliptical, 5 hearth-shaped and 4 as round. Considering the biochemical characteristics, crude oil contents varied between 54.9 - 42.1% and protein contents varied between 24.6 – 17.7%.

Key words

Diversity, fruit breeding, genetic resources, *Prunus amygdalus*

1. INTRODUCTION

Almond culture was said to be initiated four thousand years ago in Iran, Turkey, Syria and Palestine regions and spread throughout the world from these regions [1]. Almond is native to Western and Central Asia [2]. It is quite resistant to droughts and can grow in poor soils and under various ecological conditions ([3], [4], [5]). As compared to native countries, productions have grown quite more rapidly in the USA and Spain ([4], [5]). The reasons for such slow growths in productions of native countries may be related to early-blooming of almond species and thus much more prone nature to spring late freezes, large portions of production sites are composed of wild populations, yields are not consistent and socio-economic states of the countries may influence the productions ([6], [5]).

The world almond production is around 1.9 million tons and the USA, Spain and Australia are the leading producers. With 85% increase during the last decade, Turkish almond production reached to 75 thousand tons [7]. Although almond is cultured in several regions of Turkey, Mersin (9400 tons), Antalya (5700 tons), Muğla (5700 tons), Çanakkale (5300 tons) and Denizli (4600 tons) are the prominent provinces [8].

Selection breeding is the oldest breeding method and breeder selects proper plants from natural populations without creating a genetic variation and using the natural variation (Gulsoy and Balta, 2014). There are rich almond genetic resources in various parts of Anatolia. Seed-propagated trees with different genetic characteristics play a significant role in this richness. There is a need to assess the current gene sources and to get promising genotypes with regard to fruit quality attributes and yields. Almond species are quite prone to late spring freezes and thus identification of late-blooming genotypes will only be possible with selections to be made from these large populations. Since the almond is the first blooming tree in spring, culture is quite restricted in regions with late-spring freeze risks. Therefore, development of late-blooming cultivars has become the primary target of almond breeding programs ([6], [9]). The cultivars of Avalon, Solana, Sonora, Price Texas, Ne Plus Ultra, Peerles, Rosetta and Thomson used in leading almond producer country, the USA, were obtained through selections as chance seedlings ([10], [1]). The almond trees in current local populations are lost either with natural means or with anthropogenic reasons. Therefore, these populations should urgently be searched through for promising genotypes. In this way, it will be possible to identify chance seedlings with desired fruit and tree characteristics among the genetic resources spread over regions with different climates and ecological conditions [1].

Seed-propagated almond trees are quite common over the rough terrains around the northern foothills of Erciyes Mountain of Kayseri Province. In this study, naturally-growing almond populations of the region were investigated and fruit quality attributes, protein and crude oil contents of promising genotypes were identified.

2. MATERIAL AND METHODS

Almond tree populations located around Alidağı mountain, north of Erciyes mountain and south of Kayseri city center, (Haymana Bağları, Hisarcık Valley, Talas Tablakaya, Beğendik Bagları, Sakar Çiftliği, mountainous districts around Kayseri Organized Industrial Region and Yılanlıdağ regions) were used as the plant material of the present study. A total of 480 almond trees were evaluated and 34 of them were selected with regard to blooming, yield and fruit characteristics. Yield levels were assessed through a scale (1: low yield; 2: medium yield; 3: high yield). Fruit weight, fruit length, fruit width, fruit height, kernel taste, double kernel and fruit shape of selected genotypes were analyzed. Among the biochemical characteristics, crude oil and protein contents were determined in accordance with reference [11]. For investigated fruit characters, data were analyzed using JMP trial version (SAS Institute Inc.) and means were separated and grouped using Tukey's test ($P < 0.05$). Differences among selected genotypes were put forth and ultimately superior ones were identified.

3. RESULTS AND DISCUSSION

Variations were observed among genotypes with regard to investigated traits. Of the selected almond genotypes, 19 were identified as high yield, 11 as medium yield and 4 as low yield. Fruit weights varied between 1.5 – 7.6 g and significant variations were observed in fruit weights of the genotypes. Genotype 34 (7.6±0.5 g) and genotype 33 (6.9 ±0.5 g) had the highest fruit weights (Figure 1). Reference [12] in a study carried out in Kahramanmaras province, reported fruit weights of selected genotypes as between 1.31 - 7.58 g. Reference [13] in a study carried out in Isparta province, reported fruit weights of promising genotypes as between 3.51 - 5.43 g. Reference [14] in a selection study carried out in Mardin-Derik, reported fruit weights of investigated genotypes as between 1.75 - 4.77 g. Reference [15] in a selection work carried out in Aydın province, reported almond fruit weights as between 2.44 - 7.57 g. Current findings on fruit weights were generally complying with those earlier findings.

Significant differences ($P < 0.05$) were also observed in fruit dimensions of the genotypes. Fruit lengths varied between 40.7 - 19.9 mm, fruit heights between 17.4 – 10.3 mm and fruit widths between 27.6 – 11.8 mm (Table 1). In an earlier study, fruit lengths of almond genotypes were reported as between 24.00-42.88 mm, fruit heights between 16.56-29.50 mm and fruit widths between 10.60-19.18 mm [1]. On the other hand, reference [14] reported these attributes respectively as between 27.81-35.69 mm, 17.11-24.90 and 11.84-16.77 mm. Reference [15] reported fruit lengths as between 29.06-39.15.

Figure 1. Fruit and kernel images of the genotypes 34 (above) and 33 (below) with the greatest fruit weights

With regard to fruit shape of the genotypes, 13 were identified as long oval, 12 were elliptical, 5 were hearth-shaped and 4 were round shaped. With regard to kernel color, 4 had light, 8 medium and 22 had dark color kernels. On the other hand in a previous study, kernel color was mostly reported as medium. In that study, 12 genotypes had very light, 55 light, 62 medium and 28 genotypes had dark color kernels [1]. Again, reference [14] indicated kernel color of 13 selected almond genotypes as medium. Considering the taste of kernels, 9 had bitter taste and 25 had sweet taste. Reference [11] found 114 of 120 genotypes as sweet taste. On the other hand, reference [1] in a study carried out in Tunceli province, indicated taste of 82 genotypes as sweet, 8 genotypes as medium and 67 genotypes as bitter. Double kernel was not seen in almond genotypes of the present study. Although double kernel ratios vary with cultivars, it is not desired since it reduces commercial value [15].

Significant differences were observed in chemical composition of selected genotypes. Crude oil contents varied between 42.1 (Genotype 14) – 54.9% (Genotype 31) and protein contents varied between 17.7 (Genotype 3) – 24.6% (Genotype 19). The crude oil and protein of almond are quite significant for human health. In a previous study, it was noticed that edible seeds and nuts had high contents of lipids, proteins, dietary fiber and ash (minerals) and they had a good essential amino acids profile, usually with a slight lysine deficiency [16]. The genotypes with high crude oil and protein contents identified in these studies may constitute a significant source for human nutrition. Current findings on crude oil and protein contents were generally complying with the findings of previous studies on almonds. Reference [17] reported average protein content of almonds as 19% and crude oil content as 54%; reference [18]) in a study carried out in Spain, reported average crude oil content as 66.40% and protein content as 15.80%.

Table 1. Some fruit and biochemical characteristics of almond genotypes studied

G. No	F.W. (g)	F.L. (mm)	F.H. (mm)	F.W. (mm)	F.S.	Seed color	O.C. (%)	P.L. (%)
1	3,4 ± 0,5 l-n	37,5 ± 1,9 bc	12,6 ± 0,9 m-o	18,4 ± 0,6 kl	LO	Dark	47,8	18,3
2	2,3 ± 0,5 op	25,7 ± 1,5 p	10,7 ± 0,7 p	18,4 ± 1,4 kl	E	Dark	50,0	19,3
3	3,5 ± 0,3 l-n	29,6 ± 0,5 l-o	12,8 ± 0,6 l-o	20,4 ± 0,8 f-j	LO	Dark	47,1	17,7
4	4,9 ± 0,3 f-ı	32,8 ± 0,5 e-k	14,5 ± 0,7 f-l	22,3 ± 0,4 b-d	LO	Dark	52,4	18,9
5	3,7 ± 0,6 j-n	31,5 ± 2,0 h-l	13,7 ± 0,9 ı-m	20,9 ± 1,0 d-ı	E	Medium	52,0	19,0
6	3,0 ± 0,1 no	31,9 ± 0,2 g-l	11,6 ± 0,4 n-p	17,8 ± 0,2 l	H	Dark	50,0	19,3
7	3,3 ± 0,2 mn	26,9 ± 1,7 op	14,9 ± 0,4 d-k	18,8 ± 0,4 j-l	E	Medium	47,8	19,6
8	1,9 ± 0,4 p	26,0 ± 0,8 p	11,1 ± 1,2 op	15,1 ± 0,4 m	LO	Dark	49,4	18,1
9	3,2 ± 0,5 mn	27,9 ± 1,9 n-p	13,5 ± 1,2 j-m	19,2 ± 1,5 ı-l	LO	Dark	47,3	18,9
10	3,9 ± 0,8 j-m	32,3 ± 1,7 f-l	14,1 ± 0,9 h-m	19,9 ± 1,2 g-k	E	Light	47,4	18,4
11	3,3 ± 0,3 l-n	30,9 ± 0,8 ı-m	14,0 ± 0,7 ı-m	21,5 ± 1,0 c-g	LO	Dark	47,3	18,5
12	4,4 ± 0,2 h-j	35,2 ± 1,0 c-f	13,8 ± 0,4 ı-m	22,2 ± 0,6 b-f	E	Light	52,5	18,3
13	4,5 ± 0,8 g-j	33,6 ± 3,4 d-ı	17,4 ± 0,8 a	21,4 ± 4,0 c-h	E	Dark	48,1	19,9
14	3,6 ± 0,3 j-n	30,1 ± 0,4 k-n	12,8 ± 0,7 l-o	20,4 ± 0,7 e-j	LO	Dark	45,6	19,1
15	4,2 ± 0,2 ı-l	30,5 ± 1,2 j-n	16,9 ± 0,4 a-c	23,4 ± 0,4 b	H	Dark	46,6	19,1
16	2,0 ± 0,4 p	26,1 ± 0,7 p	11,1 ± 1,9 op	15,4 ± 0,5 m	LO	Dark	49,6	18,2
17	5,2 ± 0,6 e-h	33,1 ± 1,2 e-j	14,7 ± 1,0 m-o	22,3 ± 0,5 b-e	E	Dark	51,0	18,0
18	4,4 ± 0,5 h-k	35,2 ± 1,9 c-e	15,2 ± 0,8 d-j	20,8 ± 0,7 d-ı	LO	Dark	53,5	18,3
19	3,1 ± 0,4 m-o	28,4 ± 1,4 m-p	13,2 ± 1,1 k-n	19,6 ± 0,6 h-l	R	Dark	47,3	24,6
20	3,1 ± 0,3 m-o	28,4 ± 2,8 m-p	14,5 ± 1,6 g-l	19,3 ± 0,7 ı-l	LO	Medium	42,1	18,3
21	3,6 ± 0,6 k-n	34,8 ± 1,5 c-g	14,5 ± 1,4 f-l	21,7 ± 0,6 b-g	H	Medium	53,2	18,0
22	1,5 ± 0,4 p	19,9 ± 2,9 q	10,3 ± 2,1 p	11,8 ± 0,7 n	E	Dark	45,9	20,0
23	3,5 ± 0,1 k-n	31,1 ± 0,9 h-m	11,4 ± 0,7 n-p	20,4 ± 0,5 f-j	E	Medium	53,5	18,6
24	5,8 ± 0,8 c-e	38,8 ± 0,6 ab	15,4 ± 0,8 b-ı	27,6 ± 0,7 a	LO	Dark	52,8	19,3
25	3,7 ± 0,6 j-n	31,1 ± 1,5 h-m	14,6 ± 1,1 e-k	21,2 ± 1,0 c-h	E	Dark	49,7	18,0
26	6,8 ± 0,4 b	40,7 ± 0,7 a	15,9 ± 1,0 a-g	27,1 ± 0,6 a	LO	Dark	48,7	21,4
27	4,8 ± 0,5 f-ı	33,9 ± 3,2 d-h	15,2 ± 1,9 c-j	21,4 ± 1,1 c-h	H	Dark	46,9	21,6
28	5,6 ± 0,2 d-f	34,6 ± 0,7 c-g	16,5 ± 0,6 a-d	23,0 ± 0,3 bc	H	Light	52,0	21,3
29	5,3 ± 0,7 e-g	30,9 ± 1,7 ı-m	16,0 ± 1,0 a-g	22,4 ± 0,7 b-d	R	Medium	53,2	20,2
30	5,0 ± 0,5 e-ı	30,0 ± 2,3 k-n	15,8 ± 0,9 a-h	22,6 ± 0,7 b-d	R	Dark	47,7	21,2
31	6,3 ± 0,8 b-d	37,2 ± 2,2 bc	16,4 ± 1,8 a-e	25,9 ± 1,0 a	R	Light	54,9	20,2
32	6,5 ± 0,4 bc	36,4 ± 1,5 b-d	16,3 ± 0,8 a-e	26,0 ± 0,6 a	E	Medium	53,2	18,7
33	6,9 ± 0,5 ab	38,4 ± 1,9 ab	16,2 ± 1,0 a-f	26,8 ± 0,5 a	LO	Medium	50,6	19,8
34	7,6 ± 0,5 a	37,1 ± 1,3 bc	17,1 ± 1,0 ab	27,4 ± 0,5 a	E	Dark	48,1	18,5

G. No: Genotype No; FW: Fruit weight; FL: Fruit length; FH: Fruit height; FW: Fruit weight; FS: Fruit shape; LO: Long-oval; R: Round; E: Elliptic; OC: Oil content; PL: Protein level

Reference [19] reported crude oil contents of 21 almond cultivar and genotypes as between 36-5%. Reference [20] reported crude oil contents of 8 standard almond cultivars and 47 promising genotypes as between 48-67%. On the other hand, reference [21] reported crude oil contents of different almond genotypes as between 48.7–64.5% and protein contents as between 14.1-35.1%. Considering the statistical evaluation of

different fruit and biochemical characteristics together, it was observed that 7 out of 34 genotypes were prominent. These promising genotypes were identified as the genotypes 12, 13, 14, 17, 18, 26 and 28.

The genotypes identified in this study carried out in Kayseri province may be used in further breeding works and they may then be included among current standard varieties. These genotypes should be propagated through vegetative ways to assess the performance of these genotypes under different ecologies. Present outcomes may provide significant contribution in identification of quality genotypes among natural almond population of Turkey and prevention of extinction of genetic resources of the country.

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Effects of Energy Drinks with Alcohol Consumption

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Abstract

Especially among students in recent years, energy drinks with alcohol consumption has become popular and is known to the acquisition of risky behavior. According to researches; of consuming energy drinks with alcohol, compared to only consume alcohol, it reveals that they use two times more alcohol. Serious injury, sexual assault, drunk driving car, more deaths are related to alcohol consumption. When consumed with alcohol and energy drinks, there has been a dramatic increase in these adverse events. Energy drink consumption among 18-24 year olds, the results of a survey conducted on 697 students, when students mix energy drinks with alcohol; sexual abuse, physical damage, reveals that they experience negative effects, such as the need for additional medical treatment. Students often; To hide the taste of alcohol and drunkenness to get more alcohol to feel the next day, to remain under the influence of alcohol and other reasons stated that they mix alcohol with energy drinks. Energy drinks and alcohol consumption, although increasing with each passing day, there are no controlled studies on the subject. However, energy drinks and alcohol with consumption of alcohol on the central nervous system, there are many popular publications for that reduce the depressant effects. It is reported energy drinks might reduce the intensity of the depressant effects of alcohol, and this effect is attributed to energy drinks with alcohol antagonist relationship. However, little scientific data on the subject, and some do not support this view. Therefore, caution should go and should raise awareness on the topic in the community.

Key words: Alcohol Consumption, Energy Drinks, Health

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1. INTRODUCTION

The use of energy drinks are popular since the 90s, especially among young consumers “energy or power drink ", " sports nutrition " under the name of consumption is increasing. Energy drinks are sold in our country, it is known that at the beginning of the 90s. As of today, all over the world and our country, "Red Bull, Burn, Powerade, Monster, Rockstar, NOS, Full Throttle, Black Cold, Bomb, Crystal, Full Force, Power Bull, Deep Crazy Bull, the Buzz, Tiger Shot, Shark, Sole, Red Devil Red Daragon, Red Zone, Blue Ox, Buffalo, Contig is fantastic, Fire Ball, Fire, Water, Flash, Liquid, Full

Force, Full Power, Kick 4 Four, Maddox, Matador, Nexcitein to Pep One, Toreador, Zebra, Red Bat, an American Bull, Jack Wrestler, Reload, Royce Gold, the Red Edicitio, the Blue Edicitio like " widely sold under the brand names.

1.1. History of Energy Drinks

Used to improve performance and can also be called as the first drink sports drinks it has been reported to be used in 1939. [1] Energy Drink beverage of the precursor may be the first time that America Chicago in mass production in 1949, in Japan in 1960, 1980 is well known that the manufacture of similar drinks in the UK. Common sense in the world to use the current version of the year the sale of energy drinks in Turkey but across the 1980s corresponds to the 1990's. about 25 brands sold in Turkey in the EU, which also takes place on the shelves of many brands in small batches, it is stated that the total number of brands reached 42. The performance drinks, energy drinks under the first manufactured in the United States and Japan in 1970, after 10 years, has widespread use in Europe. year began to spread in Europe, the Red Bull is the brand entered the market in 1997. [2] The combination of alcohol and energy drinks consumption, despite the reduction of individual perceptions about some symptoms of alcohol intoxication, some effects (reduction in motor coordination and reaction time views, breath alcohol level) has been in existence. [3]

1.2. Effects of Alcohol Consumption of Energy Drinks With Alcohol

Especially among students in recent years, energy drinks of alcohol consumption has become popular and is known to the acquisition of risky behavior. The research results of consuming energy drinks with alcohol, compared to only consume alcohol, it reveals that they use two times more alcohol. In addition, men over women, were determined to take more risks. [4] Serious injury, sexual assault, drunk driving car, more deaths are related to alcohol consumption. When consumed with alcohol and energy drinks, there has been a dramatic increase in adverse events. [5] It is reported, energy drinks might reduce the intensity of the depressant effects of alcohol, and this effect is attributed to energy drinks with alcohol antagonist relationship. However, little scientific data on the subject, and some do not support this view. [6] Energy drinks to improve physical and mental performance, increases the ability to drive a car, it is claimed that long-term care and reduce mental fatigue. [4] Adolescents between the ages of 15-19 years, consumption of caffeine has been found to particularly increase the systolic blood pressure and lead to sleep disorders. [7] In the afternoon (14: 00-17: 00), followed by 1 night insomnia, in a study of 12 healthy young, monotonous car sucrose during driving, glucose, 80 mg of caffeine, taurine, glukoronolakto and 250 ml energy drink consumption containing vitamins sleepiness and it was found to reduce accidents. [8] In particular, two or more energy drinks after use; seventeen-year-old male patient with coronary artery spasm, and in another case of cardiac arrest have been observed. In these cases the energy drinks caused by endothelial dysfunction by increasing the platelet aggregation has been reported to induce the blood pressure. In particular, caffeine, glucuronolactone, carnitine, ginseng has been implicated as components. [9,10] Energy drinks cognitive performance (memory, attention ...) effect on stems from the caffeine it contains. taurine found in energy drinks, stimulating effect of elements such as glukoronolakto and work related interactions with one another remained missing. [11,12] Besides caffeine, guarana, have not been reported in the literature energy drinks containing herbal supplements such as ginseng and ginkgo ones though, many clinical cases associated with the consumption current. [13,14] In people with asthma and allergies, serious complications with energy drink consumption, including after using the drug ephedrine (nausea, dizziness, chest tightness during car use, fatigue, fainting, hypertension, tachycardia ...) is inferred. [15] Using energy drink, reducing the water consumption can cause decreased saliva and dental erosion. Decreased salivary flow, salivary buffering ability reduction and accelerate the formation of dental caries and dental erosion increases accordingly. [16] Recent studies conducted in rats and humans, it is stated that caffeine and taurine to stimulate the diuresis and natriuresis. Healthy 12 male volunteers, 4 separate tests drink (240 mg of caffeine and 3 g with energy drinks containing taurine, caffeine and 3 test drinks contain taurine) in a study given after 12 hours of fluid restriction, urine output and natriuresis are increased with caffeine, beverage consumption containing taurine after it was found that there is no change. The study shows that the tested energy drinks diuretic and

natriuretic effects caused by caffeine. Taurine; moderately dehydrated, fluid balance in healthy young consumers that significantly affect, the energy drink diuretic potential is to be noted that various other beverages containing caffeine. [17]

Energy drinks; heart rate, blood pressure was investigated in a study to influence ECG and blood glucose metabolism. It does not affect the metabolism of glucose energy drink, decrease in diastolic blood pressure, systolic pressure and caused an increase in heart rate was found to be of significant clinical effects on ECG parameters. [18] "High-sugar, low-caffeine-containing beverages; to reduce sleepiness and even further increase "is working on interesting results have been achieved. High-sugar level, despite the short-term to create the effect of increasing alertness or physical energy, then increase the sleepiness. Some energy drinks are also high sugar, it has a low caffeine content. In a study done, after a light lunch, 42 g sugar, 250 ml after the consumption of energy drinks containing caffeine 30 mg low levels were found not become irresistible sleepiness. This results; with major changes in blood glucose levels (hypoglycemia rebounds) it is described. In this case, the caffeine content of energy drinks on the agenda and in the case of low "due to sleepiness sugar into money, turning effect of caffeine did they remain insufficient to reverse this situation" suggests the question. In short, if the low level of caffeine in energy drinks, which reduce the level of sleepiness, even after attention was drawn to an increased sleepiness. [19]

2. CONCLUSION

Energy drinks and alcohol consumption, although increasing with each passing day, there are no controlled studies on the subject. However, energy drinks and alcohol with consumption of alcohol on the central nervous system, there are many popular publications for that reduce the depressant effects. It is reported energy drinks might reduce the intensity of the depressant effects of alcohol, and this effect is attributed to energy drinks with alcohol antagonist relationship. However, little scientific data on the subject, and some do not support this view. Therefore, caution should go and should raise awareness on the topic in the community.

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