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Assessing and Ranking the Products Using Topsis (Case Study: Pharmaceutical Processing Company of Savadkouh Mazandaran In 2016)

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Abstract

In a competitive market challenge among organizations to reduce costs, increase profits and achieve success for the organization is stable. Ranking in producing products is the factors that can be efficient in achieving these important goals. The aim of this study is rankings for the production of Volek oils in various capacities (20, 4, and 1) for processing agricultural chemistry pol sefid company in Savad kouh using TOPSIS model to prioritize the production. In this study, to collect data, library method was used to determine Introduction and background research and to collect data field method was used. Given the importance of this research is measurement of the views of scholars and experts, in five levels (cost, market demand, sales management, technology, overhead costs) and examined options of three different containers 20, 4 and 1liter Volek oil respectively. Research data collected using questionnaires and distribute them among 36 experts and to determine the index weight, software entropy Shannon solver 2015 used finally, using TOPSIS technique research data, were analyzed and options were ranked. Data collection in this study was conducted by distributing questionnaires through manufacturing sector experts and rankings for oil production 20, 4, 1 liter capacities respectively, with a weight of 0.09207, 0.09246 and 0.91300 were identified. The results showed, 20-liter Volek oil, according to the criteria of cost, market demand, sales management, technology and overhead cost factor was 91.3% compared to the of two other oil producers was superior and was at the first priority manufacturing. It was also found that 1-liter Volek oil ranked higher than 4-liters Volek oil.

Keywords: Topsis technique, weights matrix criteria, ratings, Volek oil

Introduction

At the time of such services products or goods of an organizations was bought by customers and the organization has not special concern to create change in their system and its improvement. In other words, customers obliged to buy any commodity that can be found in the market, but gradually increasing the number of manufacturers and the emergence of more competitors and selected customers purchase their products were not forced. And a variety of products and organizations provided that customers chose needed goods with the appropriate options. The rapid technological development, increased risks of globalization and privatization of environmental characteristics are expectations that business organizations are facing today [1]. Today, companies due to the competitive environment in the market, always trying to improve quality and reduce costs of goods, and improve the quality and reduce the cost seeks to maintain and expand their market share. In this regard, it should always be trying to assess the competitive position and its performance with other competitors that by evaluating and analyze results, identify their strengths and weaknesses and by overcoming defects and weaknesses as well as improving strengths expand their market share [2]. Studies have shown that in times of crisis considering numbers of solutions is better than few numbers of solutions than to come out of the situation. In such situations there are different ways which determine the right solution to fix the problem. Individuals may use the laws of probability and involved by risk and chance. Some may act with others opinion. In the world economy we may deal with such issues among these manufacturing companies more deal with this. Because their products must be sold If not thy incur losses. The service institutions in the face of such problems, at worst, only incur losses of overhead costs [3].

Agricultural pesticides:

Until the nineteenth century and early twentieth century a number of chemical pesticides for use in agriculture was prepared that included sulfur, sulfate, copper and lime, lead arsenate and HCN, but the main impetus for research on pesticides insecticides, was created during World war II and as a result the number of compounds were widely used in the 1950s, including DDT, BHC, MCPA Since then, many types (insecticides), weeds (herbicides), fungus (fungicides) and worms (worm-killing) are among them [4]. Today, companies producing agricultural pesticides to increase sales and profitability are Guido expand market share. Therefore, in this regard for their weaknesses and shortcomings are trying to evaluate and rank their products to analyze the results to identify their weaknesses and take steps to solve them.

Topsis techniques*:*

multi-criteria decision-making methods, is different, each has its own characteristics and application requirements. One of the techniques that are used to rank the factors is TOPSIS model [5]. Topsis model was suitable only for ratings which were presented by Hwang and Yoon in 1981 [14]. The concept of this model, the shortest distance from the positive ideal solution (PIS), and furthest away from the negative ideal solution (NIS) is to resolve the issues that faced with multiple decision criteria [15]. Topsis is a decision algorithm technique (very strong compensatory multi-criteria for ranking options through like the ideal answer that to weighting techniques, have very little sensitivity and response does not change deeply. According to Huang Yong, the problem with multi-criteria decision analysis considered as a geometric system in which *m* option (10, 5, 1 and 20 liter oils in this study) is evaluated with *n* criteria (5

criteria in this research). This similar option with the *m* points is in *n* dimensional space. So the best option in this space is closest option to the ideal response and the furthest option is the worst response [14],[16].

Review in literature

Gamini and Jamshid using Topsis model for the city of Kermanshah in terms of health indicators used in the cities of Qasr-e Shirin and Salas and Babajani respectively, with a final score 0.781 and 0.191 are the most and the poorest province in terms of Mandy health indicators therapy. [6] Shams al-Din Salim Karimi in his article for the evaluation and ranking of the 43 companies Topsis method to produce color and according to the technical standards and production, staffing, market situation, quality, service extraction of sales and financial results indicate high-performance enterprise birch in comparison with other companies[2].

Meanwhile in Erfani and Hmati study as rating factors affecting the banking sources Topsis method in Semnan province attempt to determine the factors affecting the banking resources in Semnan province in the period 2001-2011, ranking these factors by Topsis (Topsis). The results of the ranking factors affecting the banking sources Topsis method in Semnan province (Topsis) shows that confidence in the banking system with 0.6884 is at the first place among the factors affecting the banking resources of the province and in different scenarios (with and without consideration the impact of the equation variables), and therefore these factors also rank among commercial banks and specialized Province, is also different [7]. In this study, S. and M. Sargolzaee as a priority the establishment of service centers for villagers at the entrance of the north-eastern city of Zabol Using Topsis, comparative between service centers for villagers to build at the entrance of the city of Zabol done on the basis of importance, priority their packaging. Results obtained by using Topsis shows that health care ranked first with 0.979, 0.893 second commercial services, administrative services and educational services 0.032 0.329 in the third was in fourth place [8]. Hosseini in his research using multi-criteria decision Topsis (technique ranked proposals with respect to the similarity to ideal solution) and Ahp (Analytical Hierarchy Process Simple weight) to solve the problem is to choose the optimal system construction [9]. Babai heravi in his research as to identify and prioritize the factors in empowering Topsis method with a case study in East Azerbaijan Province Gas Company to conclude that respectively training, system implementation and participation, in staff motivation, delegation, rewards-based performance, teamwork, job Commercializing rich and sense of responsibility to empower the employees are top priority achieved [10]. In Jvanmardi and colleagues study rating various spheres of environmental and human health risks of nanotechnology using fuzzy Topsis and Ahp in different risk classes according to the weights obtained for each of the research areas and risk in each category of risk, and using fuzzy Topsis, are ranked. After that allergens skin and dangerous for human health and the aquatic environment threatens the environment and have minimal impact on genetic mutagens[11]. This study Ale Tashin Guma used Topsis and Ahp methods to examine hazardous waste material of transport companies and by the use of these two methods suitable locations for removing hazardous wastes are prioritized [17].

Structure and method

In this study, to collect data from two researches methodology was used, in a way that using library (including review articles and journals, relevant books and thesis related) to determine Introduction and background research and to collect data field method was used. The aim of this study is rankings for the

production of Volek oils in various capacities (20,4,1) for processing agricultural chemistry Pol sefid company in Savad kouh using Topsis model to prioritize the production. The population of this study contains 36 manufacturing sector experts. This study was designed to measure the cost model, market demand, sales management, technology and overhead costs. Techniques used in this research were Topsis method to prioritize products chemistry molded processing companies Savad kouh ShurMast. Collecting information in this article as well as a self-made questionnaire assessing and ranking the products by using TOPSIS (now processed agricultural chemistry) of Savad kouh shoormast company. In addition, the software entropy Shannon solver 2015 to produce research criteria weights matrix (20, 4, 1 oils liter) is used. Also the rate to the questionnaire was set design and implemented, according to Table 1 compares the 9times Spectrum (linguistic variables). Finally, using TOPSIS technique research data, were analyzed and options were ranked.

Determining weights of research criteria:

Various criteria have different weights. To do this various methods, such as Linmap, Shannon entropy, the method of least squares weighted and special vector can be used [12]. Shannon entropy methods are based on the idea that the more distribution of the values means more important indicator index [13]. Then for weighting the criteria in this study, the software entropy Shannon solver 2015 is used as a computational program that is based on the Shannon entropy.

prioritize options using the techniques of Topsis:

In this way, in order to prioritize products using TOPSIS technique should take the following steps respectively. That is:

Calculating non-scale Matrix by method N:

This process tries to change index with different dimensions into no dimensional index to make comparing the index possible. N normalized matrix is calculated as follows. For this purpose, any matrix element is divided to the sum of the squares of each column (column i (for index x_i)).

$$\mathbf{N_{ij}}=\frac{\mathbf{rij}}{\sqrt{\sum_{i-1}^{n} rij^2}}$$

Calculating weights with a method of weighting matrix W:

a set of weights (w1, w2, ..., wn) w = N is added to the matrix by the decision maker. As mentioned factors or by decision or by a method of assessment data such as entropy weights (in the study of software entropy Shannon solver 2015 is used).

Calculating weighted Scale Matrix V:

This matrix can be calculated by multiplying each column of the matrix *N* in the corresponding W_j.

$$V = N*W_j$$

Ideal positive solution V_j+:

Maximum amount for the positive index and minimum amount for negative is a vector of the best values for each indicator.

$$V_j^+ = \{\max(V_{ij}) \,|j\epsilon s^+; \min(V_{ij}), j\epsilon s^-\}$$

Ideal negative solution V_j-:

Maximum amount for the positive index and minimum amount for negative is a vector of the best values for each indicator.

$$V_j^- = \{\min(V_{ij}) \,|j\epsilon s^+; \max(V_{ij}), j\epsilon s^-\}$$

Calculating the size of separation:

separation distance between each item can be measured through n-dimensional Euclidean. Each solution is the ideal solution separation distance is calculated as follows.

$$d_i^+ = \sqrt{\sum_{k=1}^{m} (V_{ik} - V_{ik}^+)^2}$$

Similarly, away from the negative ideal is:

$$d_i^- = \sqrt{\sum_{k=1}^{m} (V_{ik} - V_{ik}^-)^2}$$

To put it simply individual elements of each matrix *V* are subtracted from corresponding V_j^+ and once fromV_j^-. All these elements are then added together to ensure d_i^+ *and* d_i^- respectively.

Determine the proximity of an option to the ideal solution:

V_i relative proximity to the V^+ is calculated as follows.

$$CL_i^* = \frac{d_i^-}{d_i^- + d_i^+}$$

Clearly, if $V_i = V^+$ then $CL_i^* = 1$ *and* if $V_i = V^-$ then $CL_i^* = 0$. CL_i^* Be closer to 1, V_i options also will be closer to V^+.

Ranking options based on larger CL:

Options are arranged in descending order CL_i^*

processing analysis TOPSIS:

In order to prioritize products using TOPSIS in the form of whole 9-comparison test (linguistic variables), the first option (20,4,1 ml) and then indicators (cost, market demand, sales management, technology and overhead costs), and then specify commenters, comparing the indicators in the form of linguistic variables are listed in table 1. In the same way to help the whole 9-Scale Matrix Binary comparison and combination of ideas are formed.

Table 1: 9 times spectrum comparison test (verbal variables) [11].

1	2	3	4	5	6	7	8	9
Equally important	Pretty little	Little	Modest	Average	Large-scale	Much	Pretty much	Too much

analytical model

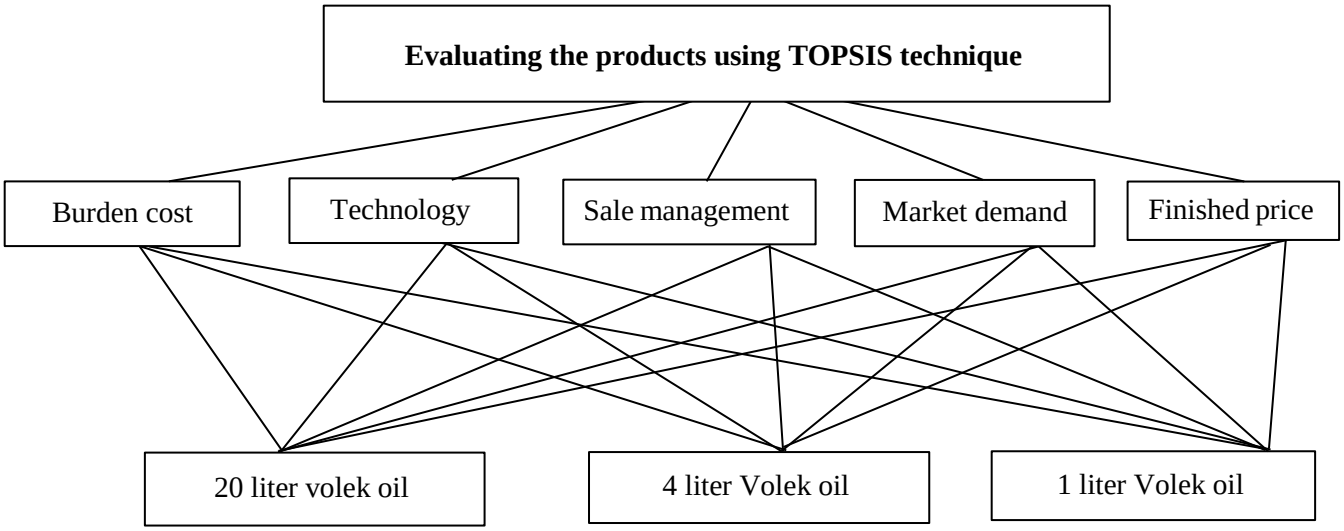


Figure 1: Analytical Model of Research

Research territory:

Agricultural chemical industrial processing company located in Industrial Park Shoormast Pol sefid Savad kouh in Mazandaran province, Mohammad Rahmati as CEO and Vice President Mr. Hamid is Nasrollazadeh. The company's products, a variety of toxins and pesticides and liquid fertilizers and

chemical products, such as: types of insecticides such as 20,4,1 liter lubricating oil (Volk) 1 -liter Diazinon liter, , 1-liter Chlorpyrifos, 1-liter sipermetrin molluscicides, 1-kilogram and 0.5 kilogram Metaldehyde and a variety of herbicides such as Granfvzyt (Randab), Butachlor - paraquat and 2,4-D.

Research findings

Results Descriptive statistics:

For each of the indicators in terms of qualitative and quantitative questionnaire which was among 36 experts and scholars to collect data used and its distribution between users and experts competent, comments received and after extraction, are used in the calculations. 23 males and 13 females were responding to the survey questionnaire.

Table 2: Number and percentage of men and women in this study

Female		**Male**	
Percent	**Number**	**Percent**	**Number**
36%	13	64%	23

With regard to Table 2 in the study, 36 percent of respondents were women and 64 percent of them were men. In this study, the number of experts that more men than women.

Then, according to Table 3 Descriptive statistics Respondents to the breakdown of marital status, age and level of education provided. 50% of the population of this study was single and 50% were married, 38 percent is the highest percentage by age in the study, ages 30 to 39 years and approximately 47 percent of the experts in this study are those that document have a bachelor's degree.

Table 3: Descriptive statistics Respondents in this study

Row	Group	Index	Female		Male		Total	
			Number	Percentage	Number	Percentage	Number	Percentage
1	Marital status	Single	7	54%	11	48%	18	50%
2		Married	6	46%	12	52%	18	50%
3	Age	Under 30 years	2	15.5%	3	13%	5	15%
4		30-40 years old	6	46%	8	35%	14	38%
5		40-50 years old	3	23%	6	26%	9	25%
6		Older than 51 years old	2	15.5%	6	26%	8	22%
7	Education	Diploma	1	%7.5	4	17%	5	15%
8		Associate Degree	2	15%	5	22%	7	19%
9		M.A	7	54.5%	10	44%	17	47%
10		B.A	3	23%	4	%17	7	19%

technique results TOPSIS:

According to TOPSIS model for ranking the Company processed agricultural chemistry of Volek oils in the town of Shur Mast regarding the indicators listed first mentioned decision matrix (Table 4).

The first step is to quantify

Table 4: Quantification of the matrix

index / Item	Cost C_1	Market demand C_2	Sales management C_3	Technology C_4	Overhead cost C_5
A_1 (1 liters)	*4200*	*5.5*	*3*	*0.75*	*4800*
A_2 (4 liters)	*14500*	*2*	*5*	*1.25*	*17000*
A_3 (20 liters)	*45000*	*4.25*	*7*	*1.4*	*57000*
(D) $\sqrt{\sum a_{ij}^2}$	*4746461.84*	*8.019*	*9.110*	*2.021*	*59674.450*

It can be seen in Table 4, according to statistical data collection and analysis were total price and the overhead 20-liter oil was superior than the other oils because these two criteria perfectly have direct relationship with the volume of each product. It is noted that two other criteria (market demand and sales management) between the type of management.

Second, normalized by linear method

Table 5: Matrix N normalized

index / Item	Cost C_1	Market demand C_2	Sales management C_3	Technology C_4	Overhead cost C_5
A_1 (1 liters)	*0.00088*	*0.68582*	*0.32930*	*0.37110*	*0.08043*
A_2 (4 liters)	*0.00305*	*0.24939*	*0.54884*	*0.61850*	*0.28487*
A_3 (20 liters)	*0.00948*	*0.52995*	*0.76838*	*0.69272*	*0.95518*

In Table 5 we see that in the second stage of the technique TOPSIS, first all data obtained in the range of zero and 1 are defined and secondly, given the number of digits (5 digits), 20-liter Volk oil in all cases of the defined criteria had dedicated the maximum amount. As noted above to calculate the index weight 5multiple indexes in this study, using software entropy Shannon solver 2015, matrix weights were used.

Table 6: Weight indicators examined in the research

Index	C_2	C_2	C_3	C_4	C_5
weight	*0.391*	*0.086*	*0.063*	*0.037*	*0.421*

As is visible in Table 6, two criteria c1 (cost (with a weight of 0.391 and c2 (overhead) are weighted with a weight of 0.421 of the maximum value.

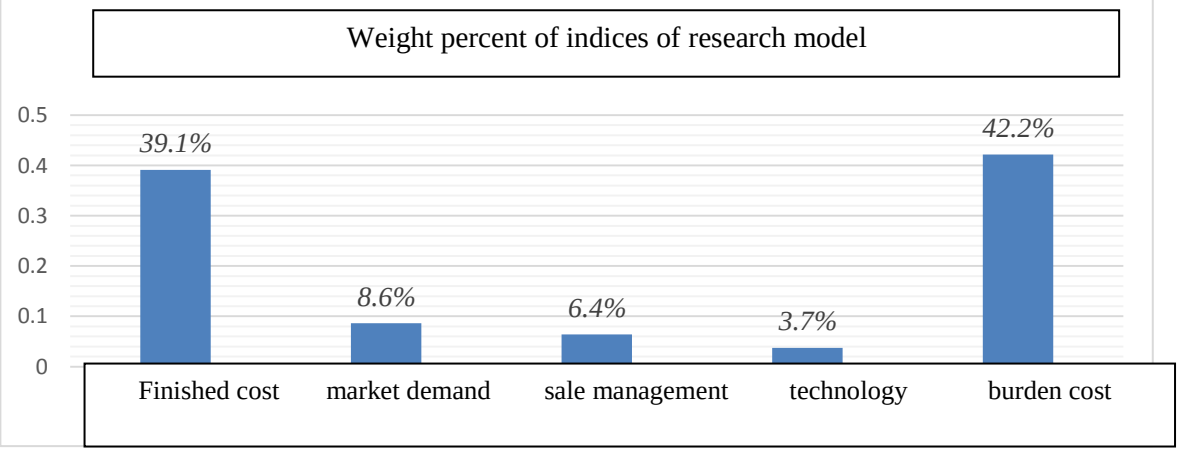


Figure 2: Percentage Weighted index based software output entropy Shannon solver 2015

According to Figure 2 the result of the analysis is obtained from the Software entropy Shannon solver 2015, Indicates that the criteria followed in ascending order starting from technology sales management and market demand and cost and at the end of the overhead cost placed that amount of their percent is in ascending order of 3.7% of, 6.4, 8.6, 39.1 and 42.2.

The third stage: Weighting

Matrix V= Weight Matrix diameter × matrix N

Table 7: matrix V

index / Item	Cost C_1	Market demand C_2	Sales management C_3	Technology C_4	Overhead cost C_5
A_1 (1 liters)	*0.00034*	*0.05901*	*0.02098*	*0.01377*	*0.03391*
A_2 (4 liters)	*0.00119*	*0.02145*	*0.03497*	*0.02296*	*0.12013*
A_3 (20 liters)	*0.00371*	*0.04559*	*0.04900*	*0.02572*	*0.40294*

In Table 7 the result of multiplying the matrix elements normalized N in weight obtained from software entropy Shannon solver 2015 is acknowledged that 20 -liters oil Volk, for all parameters defined, except for the index market demand for other indicators of the greatest value.

Step Four: Determine the ideal solution and negative ideal

After the formation of harmonic matrix based on the TOPSIS highest and lowest ranking in each of the indicators related to price, quality of raw materials and .... was found. (Table 8)

Table 8: maximum (A +) and minimum (A-) the performance of any index

index / Item	Cost C_1	Market demand C_2	Sales management C_3	Technology C_4	Overhead cost C_5
Positive ideal A^+	0.00371	0.05901	0.04900	0.02572	0.40294
Negative ideal A^-	0.00034	0.02145	0.02098	0.01337	0.03391

According to Table 8 for the ideal can be realized positive but the amount of 0.05901 for 1- liter oil Volk, other positive ideals solution is of 20-liters Volk oil. Ideal for the least amount of ideal index is negative, the amount of 1-liter oil and the amount of 0.02145 to 0.00034 for 1-liter oil, 0.020928 for 2-liter oil and 0.01337and 0.03391 2 for 1-liter amounts oil.

Fifth step: For each criteria oils distance for ideal alternative (Si +) and Minimum Alternative (Si-) was calculated. (Table 9)

Table 9: Alternative ideal (Si +) and Alternative Minimum (Si-) to separate oil

Oil capacity	S_i^-	S_i^+
1 liter	*0.03756*	*0.37035*
4 liters	*0.00857*	*0.08411*
20 liters	*0.14107*	*0.01342*

See Table 9 can be taken with the distance criterion ideal alternative for sure that (Si +) for 1 liter of oil with a value of 0.37035 against most other oils as well as the alternative minimum value (Si-) for 4-liter oil the amount to be included.

Step Six: After calculating the distance criteria, the ranking coefficient (Ci *) of each oil were calculated. (Table 10) It should be noted Ci * value is fluctuating between zero and one.

Table 10: Factor ratings and the risk of oil for TOPSIS technique

Rank	Priority factor C_i^*	(Options (oils
3	*0.09207*	1liter
2	*0.09246*	4 liters
1	*0.91300*	20 liters

According to Table 10 index of each oil tested was determined by taking the index The 20liter oil by a factor of 0.91300 in the first place rankings and 4-liter oil by a factor of 0.09246 ranked second and finally 1-liter oil by a factor of 0.09207 third place rankings, respectively.

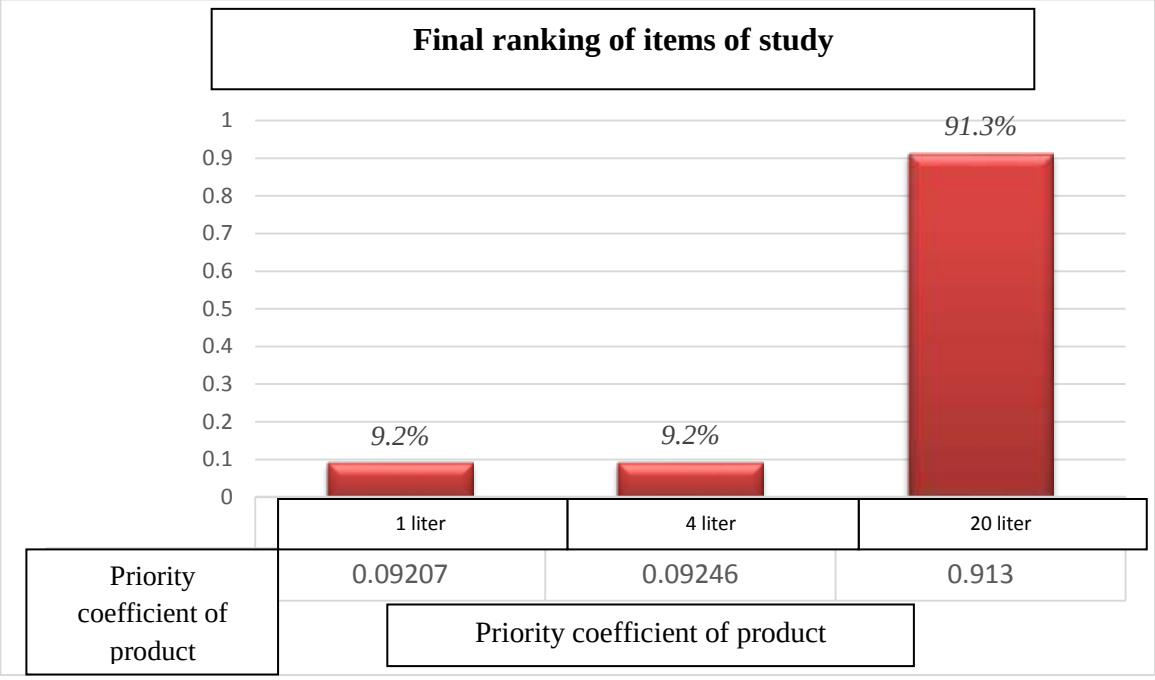


Figure 3: The final rankings of oils based on the relevant indicators using TOPSIS model

By observing Figure 3 we can see that 20 -liter Oil with the priority factor of 91.3% and 41liter oil by a factor of approximately 9.2 percent in descending order of priority are defined.

Conclusion

Analysis made with the help of TOPSIS technique and operating procedures of inquiry, facing the company processing chemistry Shur Mast Savadkuh a reasonable consequence according to Table 10 of the output TOPSIS, 20-liter oil Volk with priority coefficient of 0.91300 1-liter Volk oil with a value of 0.09207, respectively has the highest and the lowest priority to produce. According to the results obtained in this study, it is suggested to enhance the Company processed agricultural chemistry, or increase revenue and profit and reduce the incurred costs they should use a manufacturing program in which considering the importance of defined indicators and criteria, it is better to use multi-criteria decision and ranking as the output of this study in oil production and use it in strategic planning in sales and production and supply of raw materials. Finally, it is suggested to put 20-liter Volk oil production in its own macro production program finally to achieve more produce higher sales and logical and more economical profits.

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