European Journal of Prosthodontics and Restorative Dentistry (2026) 34(6S), 01–13

Statistical Analysis of Factors Affecting the Competitiveness of Mango Export Packing Companies in Nuevo Urecho, Michoacán

Keywords
SPSS, Linearity, Cronbach's Alpha, Cluster, Correlation

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Abstract
The objective is to measure the competitiveness of mango packing plants with independent variables; a matrix and a questionnaire are obtained, the results are analyzed with the SPSS statistical program and checked. 1.- Null Ho hypothesis: The independent variables do have Pearson correlation and affect the competitiveness of the packers. Alternative hypothesis Ha: The independent variables do not have Pearson correlation and do affect the competitiveness of the packers. 2.- Ho Hypothesis: Linearity is a problem, in packing houses. Hypothesis Ha: Linearity is not a problem, in the baling plants. 3.- Ho hypothesis: There is no difference between the means of the independent variables in mango packing plants. Hypothesis (Ha): If there are differences between the means. The results, based on statistical analysis, indicate that in the three hypotheses the alternative hypotheses are chosen. A single cluster is obtained because all the packers have the same conditions in the variables analyzed and, finally, a Cronbach's alpha of 92% is obtained.
JEL Codes: M1, M10, M21, M29

Received:17-06-2026
Revised:20-07-2026
Accepted: 24-07-2026
Doi:10.1922/ejprd.v34i6s.1566

1.- Introduction

It is in the public interest to design schemes that improve living conditions through economic income, generating direct jobs in the production of mangoes in the field, as well as in packaging, and indirect jobs in the purchase of technological inputs that allow efficient use of the means of production and packaging of mangoes. especially in those regions that are under development such as the municipality of Nuevo Urecho in the state of Michoacán. The handle is one of the products that have the highest economic potential abroad, so that for Mexico it is an important source of foreign exchange. AgroLatam, (2026), says that global mango production will increase from 60 million tons in 2024 to 86 million in 2033, India as the leader, followed by Brazil, Peru and Mexico with 3.6 million tons and with 22% for export.

This outstanding participation of Mexico is due to the fact that it has the right climatic and geographical conditions for an optimal development of this crop and with sufficient packing plants for export.

Michoacán stands out for being the main exporting state and one of the most important producers and exporters of mango nationwide; it contributes with 70 thousand 895 tons, being 11 municipalities the producers and exporters, Nuevo Urecho is one of them, participating in the development of the state. SADER, (2024).

In the Tierra Caliente region, it is where most of the production is destined for export. The municipality of Nuevo Urecho is among the top 5 producers at the state level; therefore, in this work we will talk about the importance of the role played by the mango product in this part of the state of Michoacán and will have the objective of carrying out competitiveness analysis, how independent variables influence the packaging of mango in the municipality of Nuevo Urecho,Michoacán**.**

Objective

Measure the competitiveness of independent variables such as: quality, price, technology, training, distribution channels and strategic planning of mango exporting packing plants to the international markets of the United States and Japan and located in the Municipality of Nuevo Urecho, Michoacán.

1.- Hypothesis

Ho Hypothesis: The independent variables do have a Pearson correlation and affect the competitiveness of the companies of mango producers and packers in the state of Michoacán.

Hypothesis Ha: The independent variables do not have Pearson correlation and affect the competitiveness of the companies of mango producers and packers in the state of Michoacán.

2.- Hypothesis

Ho: Linearity is a problem, in mango balers

Ha: Linearity is not a problem, in mango balers

3.- Hypothesis

Ho: There is no average difference in mango packing machines Ha: Yes, there is a mean difference in mango packing machines**.**

2.- Literature review

Background

Dependent variable: Competitiveness

(Bonales & Sánchez, 2003), detected that the independent variables strongly affect competitiveness, with the exception of an independent variable, whose effect is minor, which indicates that if avocado producing and packing companies want to excel, they need to improve the independent variables called quality, price, technology and training and to a lesser extent the variable distribution channels. (Bonales et_al, 2011), indicate that the competitiveness of avocado companies depends on independent variables, and it is important to say that this criterion is applicable to the value chain of the avocado product system, which indicates that they can be avocado producers and packers. (Correa, 2015), concluded that in avocado packing companies, competitiveness as a dependent variable is favorable, because the independent variables: price, technology and strategic planning, affected it minimally, however, it is important to continue working with these variables, to obtain better results. (Mandujano, 2020), determines that the competitiveness of packing and exporting companies to the United States of America is determined by independent variables, the international avocado market is governed by supply and demand, it is necessary to give it, improve these variables.

Independent variable Quality:

(Anda, 2002), defines quality as the ownership of a product and to increase it requires commitment, responsibility and work from all members of the company, also (Mandujano, 2020), determines in his research work, that the a separate independent variable, if it influences the competitiveness of the producing and packing companies, located in Tacámbaro, Michoacán, according to what was considered by (Bonales & Sánchez, 2003), found in their research that quality is very important to achieve competitiveness in the production and packaging of the fruit called avocado from the state of Michoacán, in such a way (Bonales et_al, 2011), they comment that quality is important to be more competitive for avocado producing and exporting companies. (Jimeno, 2013), in his research it turned out that a well-made product has quality, because market conditions demand it and therefore companies are more competitive and that "quality, which is an independent variable as a company culture, begins with each employee", considering (Velázquez, 2019), who found that quality, Even though there is a positive low trend and that this is already established from production, however, it is important to give credit to the fact that the good use of standards to efficiently obtain production and packaging and comply with export standards contribute to the product being more competitive in the national and international markets. The quality variable is important in the fulfillment of requirements defined by

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the customer and particularly in the production and in the packaging of avocado for export, which must carrycertain distinctive characteristics to other types of packaging, so that the product can be preserved in its packaging and transport to the place of destination. (Anda, 2002), defines quality as the ownership of a product and to increase it requires commitment, responsibility and work from all members of the company, also (Mandujano, 2020), determines in his research work, that the a separate independent variable, if it influences the competitiveness of the producing and packing companies, located in Tacámbaro, Michoacán, according to what was considered by (Bonales & Sánchez, 2003), found in their research that quality is very important to achieve competitiveness in the production and packaging of the fruit called avocado from the state of Michoacán, in such a way (Bonales et_al, 2011), they comment that quality is important to be more competitive for avocado producing and exporting companies. (Jimeno, 2013), in his research it turned out that a well-made product has quality, because market conditions demand it and therefore companies are more competitive and that "quality, which is an independent variable as a company culture, begins with each employee", considering (Velázquez, 2019), who found that quality, Even though there is a positive low trend and that this is already established from production, however, it is important to give credit to the fact that the good use of standards to efficiently obtain production and packaging and comply with export standards contribute to the product being more competitive in the national and international markets. The quality variable is important in the fulfillment of requirements defined by the customer and particularly in the production and in the packaging of avocado for export, which must carry certain distinctive characteristics to other types of packaging, so that the product can be preserved in its packaging and transport to the place of destination.

(Kotler & Armstrong, 2013), (Cited by Velázquez, 2019), mentions that the definition of price is the amount of money charged for a product or service and made at the lowest cost and with efficiency. In broader terms, price is the sum of the values that customers give up to obtain advantages from having or using a product or service. Most of the time, this variable is closely related to demand and supply, and it can benefit sellers, however, it can also affect buyers. (Bonales & Sánchez, 2003), mention in their research that the price has to do with the competitiveness of the avocado producing and packing companies located in the State of Michoacán and these variables undoubtedly influence the supply and demand of avocado. (Bonales et_al, 2011), They indicate that price is important in determining the competitiveness of avocado producing and exporting companies. Based on the above, if a product has quality, in terms of size and flavor, the price should be higher.

(Mandujano, 2020), mentions that the independent variable significantly affects the competitiveness of producing companies and avocado exporters, to the U.S., agree, because the price is closely related to demand and supply.

(Velázquez, 2019), mentions that price does not seem to have a major impact on the competitiveness of the company and this is because it is governed by supply and demand and the variation in prices can be slightly linked to the company's costs. Because avocado is a product with a good taste and its bromatological content is beneficial for health, the price is fair.

(Correa, 2015), shows us that the price variable did not affect the competitiveness variable in its entirety

In this case, the price variable is very decisive for avocado to be competitive in the market, national or international. Undoubtedly, the avocado has an accepted demand due to its internal and external characteristics.

Independent variable: Technology

(Winner, 1979), (Cited by Velázquez, 2019), mentions that technology is the use of the devices that people place daily as: technology, such as tools, devices, instruments, machines, in addition to the use of technical activities; related to skills, methods, procedures, social organization, and that have to do with productivity.

(Bonales & Sánchez, 2003), mention in their research that the technology, if it is adequate, does not affect the competitiveness of producers and packers located in the state of Michoacán. In general terms, more technology more competitiveness.

(Bonales et_al, 2011), indicate that technology is important to determine the competitiveness of avocado exporting companies. If you use good or more advanced technology, the company can be more efficient.

(Mandujano, 2020), says that the independent variable technology affects the competitiveness of avocado producing and exporting companies to the U.S. Considering the above, companies that produce and pack avocados consider more technology, to be more competitive. (Velázquez, 2019), determines that technology has an important role for the growth of the company. In a ratio of 0.5 suggests more technology the company will be more efficient. Undoubtedly, the variable technology determines the type of packaging that is given to the avocado. (Chiavenato, 2006), tells us that a company committed to a specific technology may lose the opportunity to make different and innovative products, as a technology becomes more specialized, the flexibility of the organization to move from one product to another relatively quickly decreases, however, with a complicated technology it becomes more difficult for new competitors to enter its product or service market. Considering the above, we can find companies that have simple technology or sophisticated technology, without a doubt, if you have a more sophisticated technology, it will be an obstacle for other companies, and they can compete in the market, national or international. (Correa, 2015), concludes that technology did not directly affect the competitiveness variable. Technology is very important, since it originates innovation within the processes and areas of companies, through strategies, methodologies and unions that allow perfecting the impacts towards a certain market, satisfying the needs of the consumer from strategic planning and research

with better technology.

Independent variable: Training

(Robbins, 1994), indicates that training is the increase of potential skills, so that the employee develops to a better stratum, where there must be motivation.

(Bonales & Sánchez, 2003), determined in their research that the training of people, if it is not adequate, affects the competitiveness of avocado companies and packers in the state of Michoacán. Considering the above, updating is important, because people perform their activities better (Bonales et_al, 2011), mention that the training of personnel is important to determine the efficiency of avocado producing and exporting companies. Based on better training, the staff acquires more knowledge and becomes more specialized in the work they are doing.

(Velázquez, 2019), training, despite being a variable that is not a determinant of other variables, does play an important role in the company's results. According to training, it is very feasible for people, through training, to carry out their activities better.

Undoubtedly, up-to-date preparation triggers the generation, implementation and professionalization of an industry or sector, which allows for the enhancement of intellectual capital, which has an incalculable price through knowledge, allowing the development of economic and social well-being in the environment.

Independent variable: Marketing channels

(Vázquez, 2012), Determines the marketing or distribution channel as the path to follow of a product or service from the inventory of the product within the company to the customer's consumption. It is convenient to know the best avocado marketing channels, in order to send the product to its destination, generate a strategic plan, to avoid deviations, Bonales & (Sánchez, 2003), mention in their research that the marketing channels are not adequate affect the competitiveness of the pickers and packers located in Uruapan, Michoacán and the independent variable is important, because it indicates the best way to get the avocado product, both to the national and international markets, (Bonales et_al, 2011), they say that if the marketing channels do not work properly, they affect the competitiveness of avocado exporting companies. (Velázquez, 2019), mentions that maintaining optimal distribution channels of its suppliers and customers contributes to the good results of the company.

The variable marketing channels, it is essential that marketing strategies are directed under the scheme of supply and demand that allows clarifying the market, product, product life cycle and shelf, and aconstant in the innovation and adaptation of products and services to the market such as the analysis of purchasing power and frequency of the consumer validating profitability, cost of production, expenses, income, break-even point and viability, and acceptance of the product or service in the market and its permanence, serving national and international markets.

Independent variable: Strategic planning

(Thompson et_al, 2012) tells us about strategic planning and mentions that it refers to the fact that five strategy options must be considered (low costs, product differentiation, low prices, differentiation to a small segment of buyers and better supplier costs), to locate in the market, operate the business and deliver value to customers. (Leyva et_al, 2018), mention in their research work that when applying the T test, strategic management and strategic planning as management are not rejected, which indicates that they significantly influence the competitiveness of the SMEs studied, they also consider that carrying out strategic planning will determine the actions that a company must follow to achieve the objective or goal, that is, it will give them the route to follow to carry out their activities and be able to achieve business competitiveness, Parra, (2019), mentions that strategic planning and its implementation maintains a direct relationship with the competitiveness. Therefore, it is necessary to implement strategic planning in the value chain of the avocado product system.

(Rodríguez, 2021), found that strategic planning as part of quality management confirms the hypothesis that there is a relationship between these variables and that due to the above, the competitiveness of companies is improved.

(Aragón et_al, 2010), found that it is partially proven that the choice of strategy influences competitive success.

Finally, Strategic Planning is the focus and direction of a company which is governed by the mission, vision and philosophy which outlines the commitment and specific objectives through the development of strategies and alliances that allow the implementation of innovation, profitability and viability of a company allowing the permanence of the company through competitiveness and transformation and constant adaptation to competition and demand for global markets.

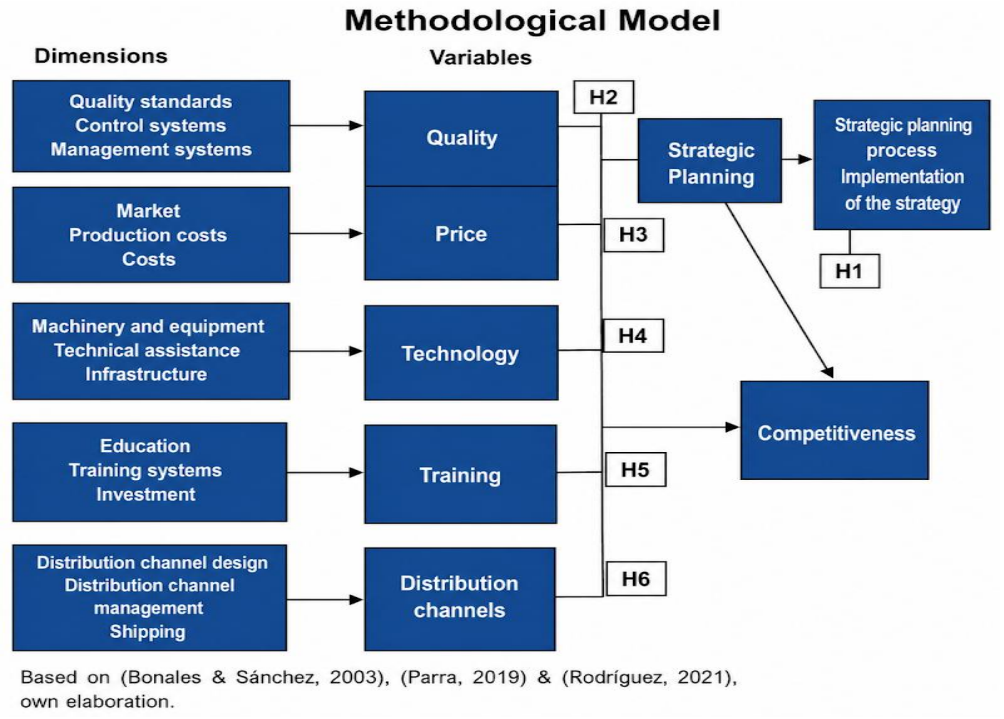
MATERIALS AND METHODS

Data collection techniques and instruments

For the collection of data, all the packing houses in the municipality of Nuevo Urecto were visited directly, the support material used were questionnaires, registered from a matrix, structured to know the different variables of interest and were made in the form of interviews with the owners and/or workers in charge of areas, to know about the way in which the company works. and also, to understand the answers in a better way.

Each of the data collected was recorded in an information matrix to analyze the results and then perform statistical analyses.

Diagram of the independent variables 1.- Figure 1 Competitiveness Model



Based on (Bonales & Sánchez, 2003), (Parra, 2019) & (Rodríguez, 2021), own elaboration.

It is an experimental, qualitative and quantitative exploratory research. Research subject, mango packing companies participating in Nuevo Urecho, Michoacán state, Mexico.

Table 2 Relevant data from the research

Research data sheet

Population	Packing companies and mango exporters.
Unit of analysis	15
Geographical limitation	Nuevo Urecho, Michoacán
Type and design of the study	Qualitative and quantitative approach.
Method of obtaining the Information	Survey with 48 questions

Source: Own elaboration

Universe, population and sample

The sample indicates a population of 15 companies in the state of Michoacán dedicated to the packaging of mangoes and established as economic units; Quality is understood as mango production (fertilization, pruning, weed, pest and disease control, liming and cutting), as well as its selection and packaging of mango. The instrument was applied directly to mango sorters and packers, considering the economic activity in which the company is located and questions related to independent variables such as quality, price, training, technology, distribution channels and strategic planning, and 48 items on the Likert scale with the classification; always, frequently, sometimes, never, and never again. No pilot tests were carried out, because there was already a history where Cronbach's alpha is very good.

Results and discussion

To perform the statistical analysis of the 15 sampled balers, the SPSS statistical program was used, where the following was found:

First, Pearson's correlation coefficient was analyzed and the results are as follows:

Table 1 Pearson's correlation coefficient

		Cal_Nor1	Cal_Nor2	Cal_Nor3	Cal_Nor4	Cal_Nor5	Cal_SCtrl1	Cal_SCtrl2	Cal_SInsp1	Cal_SInsp2	Cal_SInsp3
Cal_Nor1	Pearson Correlation	1	0.112	0.184	0.305	0.01	0.227	-0.208	-0.302	0.199	0.106
	Sig. (2-tailed)		0.691	0.51	0.269	0.972	0.415	0.458	0.274	0.478	0.703
	N	15	15	15	15	15	15	15	15	15	15
Cal_Nor2	Pearson Correlation	0.112	1	0.182	.573*	0.211	0.185	0.421	-0.07	.564*	0.399
	Sig. (2-tailed)	0.691		0.515	0.026	0.45	0.51	0.118	0.804	0.029	0.14
	N	15	15	15	15	15	15	15	15	15	15
Cal_Nor3	Pearson Correlation	0.184	0.182	1	0.326	.540*	0.37	-0.048	0.412	0.323	.658**
	Sig. (2-tailed)	0.51	0.515		0.232	0.038	0.174	0.864	0.127	0.24	0.006
	N	15	15	15	15	15	15	15	15	15	15
Cal_Nor4	Pearson Correlation	0.305	.573*	0.326	1	0.261	0.37	0.386	0.11	0.496	.551*
	Sig. (2-tailed)	0.269	0.026	0.232		0.348	0.174	0.155	0.695	0.06	0.033
	N	15	15	15	15	15	15	15	15	15	15
Cal_Nor5	Pearson Correlation	0.01	0.211	.540*	0.261	1	.594*	0.241	.652**	0.159	0.437
	Sig. (2-tailed)	0.972	0.45	0.038	0.348		0.019	0.387	0.008	0.573	0.103
	N	15	15	15	15	15	15	15	15	15	15
Cal_SCtrl1	Pearson Correlation	0.227	0.185	0.37	0.37	.594*	1	0	0.392	-0.082	0.431
	Sig. (2-tailed)	0.415	0.51	0.174	0.174	0.019		1	0.149	0.772	0.109
	N	15	15	15	15	15	15	15	15	15	15
Cal_SCtrl2	Pearson Correlation	-0.208	0.421	-0.048	0.386	0.241	0	1	0.13	.523*	-0.046
	Sig. (2-tailed)	0.458	0.118	0.864	0.155	0.387	1		0.644	0.045	0.87
	N	15	15	15	15	15	15	15	15	15	15
Cal_SInsp1	Pearson Correlation	-0.302	-0.07	0.412	0.11	.652**	0.392	0.13	1	-0.124	0.51
	Sig. (2-tailed)	0.274	0.804	0.127	0.695	0.008	0.149	0.644		0.659	0.052
Cal_SInsp2	Pearson Correlation	0.159	.564*	0.323	0.496	0.159	-0.062	.523*	-0.124	1	0.21	0.202
	Sig. (2-tailed)	0.478	0.029	0.24	0.06	0.553	0.772	0.045	0.629		0.432	0.47
	N	15	15	15	15	15	15	15	15	15	15	15
Cal_SInsp3	Pearson Correlation	0.108	0.399	.658**	.551*	0.437	0.431	-0.046	0.51	0.21	1	-0.125
	Sig. (2-tailed)	0.703	0.14	0.008	0.033	0.103	0.109	0.87	0.052	0.452		0.657
	N	15	15	15	15	15	15	15	15	15	15	15
Pre_Mer1	Pearson Correlation	0.086	-0.018	0.291	0.141	-0.213	-0.036	0.13	-0.054	0.202	-0.125	1
	Sig. (2-tailed)	0.78	0.951	0.292	0.617	0.446	0.9	0.644	0.848	0.47	0.657	
	N	15	15	15	15	15	15	15	15	15	15	15
Pre_CProd1	Pearson Correlation	-0.076	-0.28	-0.311	-0.01	-0.213	0.142	-0.065	0.351	-0.264	0.164	-0.014
	Sig. (2-tailed)	0.789	0.311	0.259	0.972	0.446	0.613	0.818	0.189	0.342	0.56	0.962
	N	15	15	15	15	15	15	15	15	15	15	15
Pre_CProd2	Pearson Correlation	0.341	.554*	0.212	.635*	0.264	0.125	.548*	0.142	.818**	0.304	0.142
	Sig. (2-tailed)	0.213	0.032	0.449	0.011	0.341	0.657	0.035	0.613	0	0.271	0.613
	N	15	15	15	15	15	15	15	15	15	15	15
Pre_CProd3	Pearson Correlation	0.225	0.443	.590*	0.478	0.494	0.503	-0.097	0.462	0.268	.801**	0.191
	Sig. (2-tailed)	0.421	0.098	0.021	0.072	0.061	0.056	0.732	0.083	0.339	0	0.496
	N	15	15	15	15	15	15	15	15	15	15	15
Pre_CProd4	Pearson Correlation	0.086	0.245	0.141	0.442	0.351	0.142	.520*	0.149	.668**	0.019	0.392
	Sig. (2-tailed)	0.78	0.378	0.617	0.089	0.2	0.613	0.047	0.597	0.006	0.946	0.149
	N	15	15	15	15	15	15	15	15	15	15	15
Pre_CProd5	Pearson Correlation	0.104	0.169	-0.048	0.385	0.05	0.171	0	0.038	.0.07	0.093	0.325
	Sig. (2-tailed)	0.713	0.548	0.864	0.155	0.851	0.542	1	0.644	0.791	0.743	0.237
	N	15	15	15	15	15	15	15	15	15	15	15
Pre_CCom1	Pearson Correlation	0.371	-0.075	0.173	0.173	-0.106	-0.153	0	0.058	.535*	0.063	0.232
	Sig. (2-tailed)	0.173	0.789	0.538	0.538	0.702	0.586	1	0.837	0.04	0.769	0.404
	N	15	15	15	15	15	15	15	15	15	15	15
Tec_Maq1	Pearson Correlation	0.381	0.206	.591*	0.473	0.443	0.419	-0.306	0.159	0	.567*	0.159
	Sig. (2-tailed)	0.161	0.46	0.02	0.075	0.098	0.12	0.267	0.571	1	0.028	0.571
	N	15	15	15	15	15	15	15	15	15	15	15

Tec_Inf2	Pearson Correlation	-0.007	0.193	0.208	.599**	0.154	0.277	0.084	0.464	0.191	0.349	0.412
	Sig. (2-tailed)	0.98	0.49	0.456	0.018	0.583	0.318	0.765	0.081	0.494	0.202	0.127
	N	15	15	15	15	15	15	15	15	15	15	15
Cap_Edu1	Pearson Correlation	0.052	-0.421	-0.241	-0.097	0.121	0.342	0.125	0.065	-0.299	-0.231	-0.13
	Sig. (2-tailed)	0.854	0.118	0.386	0.732	0.669	0.212	0.657	0.816	0.279	0.407	0.644
	N	15	15	15	15	15	15	15	15	15	15	15
Cap_Edu2	Pearson Correlation	-0.268	-0.188	-0.007	0.237	0.109	0.454	0.087	0.1	-0.334	-0.084	0.127
	Sig. (2-tailed)	0.334	0.501	0.981	0.283	0.698	0.089	0.757	0.723	0.224	0.766	0.652
	N	15	15	15	15	15	15	15	15	15	15	15
Cap_Sisc1	Pearson Correlation	-0.29	-0.033	-0.153	0.261	0.302	0.264	0.241	0.088	0.159	0.036	-0.025
	Sig. (2-tailed)	0.294	0.908	0.573	0.348	0.273	0.341	0.387	0.756	0.573	0.899	0.929
	N	15	15	15	15	15	15	15	15	15	15	15
Cap_Sisc2	Pearson Correlation	0.008	0.162	-0.122	0.2	0.096	0.078	0.324	-0.221	0.122	0.13	-0.164
	Sig. (2-tailed)	0.978	0.564	0.666	0.474	0.728	0.788	0.239	0.426	0.666	0.644	0.56
	N	15	15	15	15	15	15	15	15	15	15	15
Cap_Sisc3	Pearson Correlation	-0.209	-0.207	0.263	0.39	0.18	0.03	0.384	0.388	0.026	-0.016	.524*
	Sig. (2-tailed)	0.454	0.459	0.344	0.151	0.521	0.915	0.158	0.153	0.926	0.954	0.045
	N	15	15	15	15	15	15	15	15	15	15	15
Cap_Sisc4	Pearson Correlation	.571*	-0.04	-0.023	0.15	-0.058	-0.082	0.299	-0.124	0.196	0.044	0.202
	Sig. (2-tailed)	0.026	0.887	0.936	0.593	0.838	0.772	0.279	0.659	0.483	0.876	0.47
	N	15	15	15	15	15	15	15	15	15	15	15
Cap_Inv1	Pearson Correlation	0.168	0.399	0.5	.770**	0.346	0.277	0.312	0.381	0.289	0.427	0.308
	Sig. (2-tailed)	0.549	0.141	0.058	0.001	0.207	0.317	0.258	0.162	0.297	0.113	0.264
	N	15	15	15	15	15	15	15	15	15	15	15
Cap_Inv2	Pearson Correlation	0	-0.238	-0.41	-0.273	-0.511	-0.484	-0.354	-0.184	-0.423	-0.131	-0.184
	Sig. (2-tailed)	1	0.392	0.129	0.325	0.051	0.067	0.196	0.512	0.117	0.642	0.512

Cad_Doc1	Pearson Correlation	0.38	.645**	0.196	.716**	0.058	0.286	0.374	0.124	0.453	0.264
	Sig. (2-tailed)	0.168	0.009	0.483	0.003	0.838	0.306	0.17	0.659	0.216	0.09
	N	15	15	15	15	15	15	15	15	15	15
Cad_Adc1	Pearson Correlation	0.174	.645**	.600**	.600**	0.346	0.218	0.448	0.28	.607**	0.509
	Sig. (2-tailed)	0.536	0.009	0.018	0.018	0.207	0.435	0.094	0.313	0.016	0.050
	N	15	15	15	15	15	15	15	15	15	15
Cad_Adc2	Pearson Correlation	0.162	0.413	0.355	.710**	.591*	0.238	.612*	0.478	0.368	0.159
	Sig. (2-tailed)	0.572	0.136	0.194	0.003	0.02	0.38	0.015	0.072	0.18	0.571
	N	15	15	15	15	15	15	15	15	15	15
Cad_Adc3	Pearson Correlation	0.267	0.392	0.225	.586*	0.26	0.085	.519*	-0.086	0.323	-0.302
	Sig. (2-tailed)	0.336	0.149	0.421	0.022	0.349	0.762	0.047	0.76	0.241	0.274
	N	15	15	15	15	15	15	15	15	15	15
Cad_Adc4	Pearson Correlation	-0.325	-0.075	-0.475	0.173	-0.106	-0.15	.569*	0.058	-0.124	-0.349
	Sig. (2-tailed)	0.237	0.789	0.073	0.538	0.702	0.586	0.03	0.837	0.653	0.203
	N	15	15	15	15	15	15	15	15	15	15
Cad_Emb1	Pearson Correlation	0.209	0.207	0.373	0.5	.513*	.570*	0.439	0.296	0.17	0.16
	Sig. (2-tailed)	0.454	0.459	0.171	0.058	0.015	0.026	0.102	0.283	0.544	0.57
	N	15	15	15	15	15	15	15	15	15	15
Cad_Emb2	Pearson Correlation	0.45	.659**	0.277	.651**	0.185	0.263	.611*	-0.145	.543*	0.1
	Sig. (2-tailed)	0.093	0.008	0.318	0.005	0.509	0.344	0.016	0.606	0.037	0.723
	N	15	15	15	15	15	15	15	15	15	15
Pie_Prc1	Pearson Correlation	-0.14	0.193	-0.04	0.412	0.464	0.036	.715**	0.382	0.077	-0.054
	Sig. (2-tailed)	0.618	0.491	0.887	0.127	0.082	0.9	0.003	0.149	0.7	0.848
	N	15	15	15	15	15	15	15	15	15	15
Pie_Prc2	Pearson Correlation	0.493	.518*	0.398	0.499	0.352	0.215	0.48	-0.036	.762**	-0.009
	Sig. (2-tailed)	0.062	0.048	0.142	0.058	0.185	0.441	0.07	0.898	0.001	0.974
	N	15	15	15	15	15	15	15	15	15	15

Pie_Prc3	Correlación de Pearson	0.238	0.25	-0.247	0.143	0.114	0.046	0.169	-0.018	-0.161	0.1	-0.333
	Sig. (bilateral)	0.393	0.369	0.374	0.611	0.686	0.87	0.548	0.951	0.566	0.723	0.225
	N	15	15	15	15	15	15	15	15	15	15	15
Pie_Prc4	Correlación de Pearson	0.03	0.395	0.226	0.226	0.035	0.134	0.366	0.076	0.481	0.108	0.304
	Sig. (bilateral)	0.914	0.145	0.418	0.418	0.901	0.635	0.18	0.787	0.069	0.701	0.27
	N	15	15	15	15	15	15	15	15	15	15	15
Pie_Imp1	Correlación de Pearson	.572*	-0.018	-0.311	-0.01	0.163	0.32	0.13	-0.257	-0.031	-0.414	-0.014
	Sig. (bilateral)	0.026	0.951	0.259	0.972	0.562	0.244	0.644	0.356	0.912	0.125	0.962
	N	15	15	15	15	15	15	15	15	15	15	15
Pie_Imp2	Correlación de Pearson	0.182	0.148	0.226	0.085	-0.141	-0.2	0.366	-0.114	0.262	-0.027	0.304
	Sig. (bilateral)	0.515	0.599	0.418	0.764	0.616	0.474	0.18	0.685	0.345	0.924	0.27
	N	15	15	15	15	15	15	15	15	15	15	15
Pie_Imp3	Correlación de Pearson	0.022	-0.07	-0.191	0.11	-0.1	0.392	-0.065	0.392	-0.357	0.221	0.149
	Sig. (bilateral)	0.939	0.804	0.496	0.695	0.722	0.149	0.818	0.149	0.191	0.428	0.597
	N	15	15	15	15	15	15	15	15	15	15	15
Pie_Imp4	Correlación de Pearson	0.018	0.384	0.093	.601*	-0.243	-0.27	.603*	-0.182	.681**	0.065	0.467
	Sig. (bilateral)	0.949	0.157	0.741	0.018	0.382	0.33	0.017	0.515	0.005	0.818	0.079
	N	15	15	15	15	15	15	15	15	15	15	15
Pie_Imp5	Correlación de Pearson	0.26	0.421	-0.193	0.241	0.06	0.342	0.438	-0.065	0.075	-0.046	-0.065
	Sig. (bilateral)	0.35	0.118	0.49	0.386	0.831	0.212	0.103	0.818	0.791	0.87	0.818
	N	15	15	15	15	15	15	15	15	15	15	15
Pie_Imp6	Correlación de Pearson	0.26	-0.084	-0.048	.531*	0.06	0.171	0.25	0.13	0.075	0.231	-0.065
	Sig. (bilateral)	0.35	0.765	0.864	0.042	0.831	0.542	0.369	0.644	0.791	0.407	0.818
	N	15	15	15	15	15	15	15	15	15	15	15

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Because the (bilateral) Sig. is greater than 0.05, there is no correlation between the independent variables. Source of the notes of the subject categorical variables of Avalos, (2023),

Cuadro. - 2 Desviación de la linealidad

Linealidad							
Tabla de ANOVA							
			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Cal_Nor4	Entre grupos	(Combinado)	128.25	4	32.063	2.113	0.154
		Linealidad	0.422	1	0.422	0.028	0.871
		Desviación de la linealidad	127.828	3	42.609	2.808	0.094
	Dentro de grupos		151.75	10	15.175		
	Total		280	14			
Tabla de ANOVA							
			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Cal_Nor5	Entre grupos	(Combinado)	13.077	2	6.538	0.294	0.751
		Linealidad	6.522	1	6.522	0.293	0.598
		Desviación de la linealidad	6.555	1	6.555	0.295	0.597
	Dentro de grupos		266.923	12	22.244		
	Total		280	14			
Tabla de ANOVA							
			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Cal_SCtrl1	Entre grupos	(Combinado)	38.31	3	12.77	0.581	0.64
		Linealidad	32.256	1	32.256	1.468	0.251
		Desviación de la linealidad	6.053	2	3.027	0.138	0.873
	Dentro de grupos		241.69	11	21.972		
	Total		280	14			

Tabla de ANOVA							
			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Cal_SInsp1	Entre grupos	(Combinado)	54.591	3	18.197	0.888	0.477
		Linealidad	35.244	1	35.244	1.72	0.216
		Desviación de la linealidad	19.347	2	9.673	0.472	0.636
	Dentro de grupos		225.409	11	20.492		
	Total		280	14			
Tabla de ANOVA							
			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Cal_SInsp2	Entre grupos	(Combinado)	59.028	3	19.676	0.979	0.438
		Linealidad	2.827	1	2.827	0.141	0.715
		Desviación de la linealidad	56.201	2	28.1	1.399	0.288
	Dentro de grupos		220.972	11	20.088		
	Total		280	14			
Tabla de ANOVA							
			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Cal_SInsp3	Entre grupos	(Combinado)	53.533	4	13.383	0.591	0.677
		Linealidad	19.947	1	19.947	0.881	0.37
		Desviación de la linealidad	33.587	3	11.196	0.494	0.694
	Dentro de grupos		226.467	10	22.647		
	Total		280	14			

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			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Pre_Mer1	Entre grupos	(Combinado)	117.117	2	58.558	4.314	0.039
		Linealidad	112.043	1	112.043	8.254	0.014
		Desviación de la linealidad	5.074	1	5.074	0.374	0.552
	Dentro de grupos		162.883	12	13.574		
	Total		280	14			

Tabla de ANOVA

			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Pre_CProd1	Entre grupos	(Combinado)	14.424	2	7.212	0.326	0.728
		Linealidad	13.125	1	13.125	0.593	0.456
		Desviación de la linealidad	1.299	1	1.299	0.059	0.813
	Dentro de grupos		265.576	12	22.131		
	Total		280	14			

Tabla de ANOVA

			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Pre_CProd2	Entre grupos	(Combinado)	27.033	4	6.758	0.267	0.892
		Linealidad	2.553	1	2.553	0.101	0.757
		Desviación de la linealidad	24.481	3	8.16	0.323	0.809
	Dentro de grupos		252.967	10	25.297		
	Total		280	14			

Tabla de ANOVA

			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Pre_CProd3	Entre grupos	(Combinado)	6.45	4	1.613	0.059	0.993
		Linealidad	3.912	1	3.912	0.143	0.713
		Desviación de la linealidad	2.538	3	0.846	0.031	0.992
	Dentro de grupos		273.55	10	27.355		
	Total		280	14			

Tabla de ANOVA

			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Pre_CProd4	Entre grupos	(Combinado)	67.167	3	22.389	1.157	0.37
		Linealidad	5.104	1	5.104	0.264	0.618
		Desviación de la linealidad	62.063	2	31.031	1.604	0.245
	Dentro de grupos		212.833	11	19.348		
	Total		280	14			

Tabla de ANOVA

			Suma de cuadrados	gl	Media cuadrática	F	Sig.
ID * Pre_CCom1	Entre grupos	(Combinado)	98.433	3	32.811	1.988	0.174
		Linealidad	12.784	1	12.784	0.775	0.398
		Desviación de la linealidad	85.649	2	42.825	2.594	0.119
	Dentro de grupos		181.567	11	16.506		
	Total		280	14			

According to Avalos, (2023) the deviation from linearity must be greater than 0.05 and is linear, and not problematic, linearity is the relationship between the Independent variable and the Dependent variable.

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Table. – 3 Analysis of variance

Analysis of Variance					
Source	GL	SC Adjustment	MC Adjustment	Value F	Value p
Factor	47	568.7	12.1	9.72	0
Error	672	836.9	1.245		
Total	719	1405.6			

Because the calculated F value is greater than the tabulated F, there is a significant difference between the means; due to the above, the Tukey test or separation of socks is performed. This tells us that all the averages of the balers are different in the independent variables.

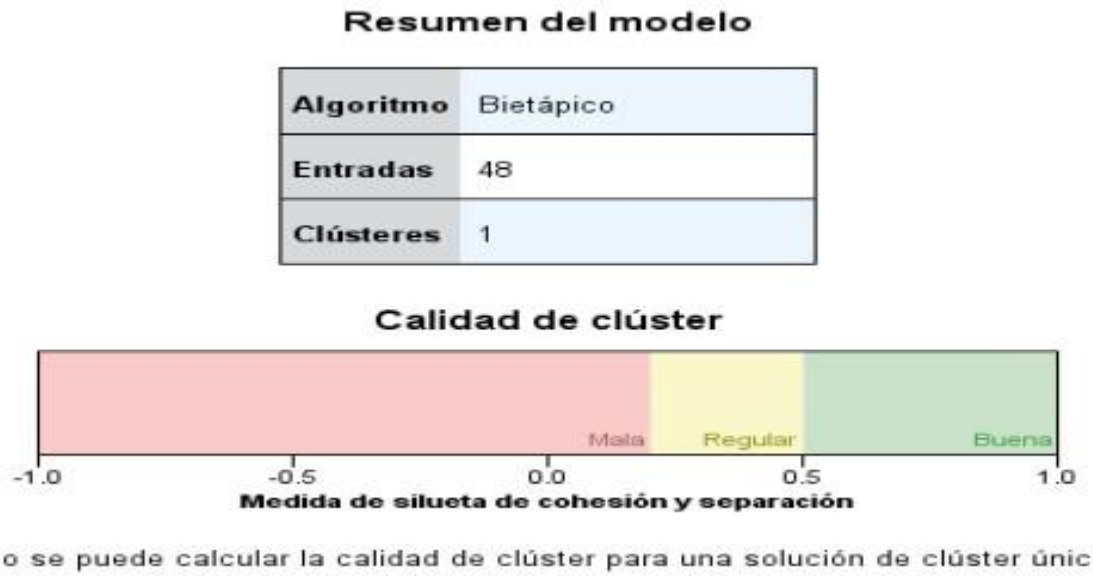
Table 4.- Tukey's test, in which nine groups are formed

Comparison of averages												
To group information using Tukey's method and a 95% confidence												
Factor	**N**	**Media**	**Grouping**									
Cal_SCtrl2	**15**	**5**	**A**									
Cal_Nor3	**15**	**5**	**A**									
Cal_Nor2	**15**	**5**	**A**									
Ple_Prc2	**15**	**4.9333**	**A**	**B**								
Pre_CProd5	**15**	**4.9333**	**A**	**B**								
Ple_Imp4	**15**	**4.8667**	**A**	**B**	**C**							
Ple_Imp3	**15**	**4.8667**	**A**	**B**	**C**							
Ple_Imp2	**15**	**4.8667**	**A**	**B**	**C**							
Cal_Nor1	**15**	**4.867**	**A**	**B**	**C**							
Ple_Prc4	**15**	**4.733**	**A**	**B**	**C**	**D**						
Ple_Imp6	**15**	**4.667**	**A**	**B**	**C**	**D**	**E**					
Ple_Imp5	**15**	**4.667**	**A**	**B**	**C**	**D**	**E**					
Ple_Prc3	**15**	**4.667**	**A**	**B**	**C**	**D**	**E**					
Ple_Prc1	**15**	**4.667**	**A**	**B**	**C**	**D**	**E**					
Cal_Nor5	**15**	**4.667**	**A**	**B**	**C**	**D**	**E**					
Ple_Imp1	**15**	**4.533**	**A**	**B**	**C**	**D**	**E**	**F**				
Cal_SInsp1	**15**	**4.467**	**A**	**B**	**C**	**D**	**E**	**F**				
Pre_CCom1	**15**	**4.4**	**A**	**B**	**C**	**D**	**E**	**F**				
Cad_Emb1	**15**	**4.333**	**A**	**B**	**C**	**D**	**E**	**F**				
Cad_Adc3	**15**	**4.333**	**A**	**B**	**C**	**D**	**E**	**F**				
Cal_SInsp2	**15**	**4.333**	**A**	**B**	**C**	**D**	**E**	**F**				
Cap_Sisc4	**15**	**4.267**	**A**	**B**	**C**	**D**	**E**	**F**				
Cad_Dcd1	**15**	**4.133**	**A**	**B**	**C**	**D**	**E**	**F**	**G**			
Pre_CProd1	**15**	**4.133**	**A**	**B**	**C**	**D**	**E**	**F**	**G**			
Pre_Mer1	**15**	**4.067**	**A**	**B**	**C**	**D**	**E**	**F**	**G**			
Cad_Emb2	**15**	**4**	**A**	**B**	**C**	**D**	**E**	**F**	**G**			
Tec_Maq1	**15**	**3.933**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**		

Table 5.- Indicates that only one Two-stage cluster is generated

Cad_Adc4	**15**	**3.867**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**		
Pre_CProd4	**15**	**3.8**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**		
Cal_SCtrl1	**15**	**3.8**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**		
Tec_Inf2	**15**	**3.733**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**		
Cal_Nor4	**15**	**3.667**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**		
Tec_Maq2	**15**	**3.6**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**		
Cap_Sisc2	**15**	**3.467**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**		
Tec_Inf1	**15**	**3.467**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**		
Pre_CProd2	**15**	**3.467**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**		
Cap_Edu1	**15**	**3.333**		**B**	**C**	**D**	**E**	**F**	**G**	**H**		**J**
Cal_SInsp3	**15**	**3.333**		**B**	**C**	**D**	**E**	**F**	**G**	**H**		**J**
Cad_Adc2	**15**	**3.267**			**C**	**D**	**E**	**F**	**G**	**H**		**J**
Cap_Sisc3	**15**	**3.2**				**D**	**E**	**F**	**G**	**H**		**J**
Pre_CProd3	**15**	**3.067**					**E**	**F**	**G**	**H**		**J**
Cap_Sisc1	**15**	**3**						**F**	**G**	**H**		**J**
Cap_Edu2	**15**	**2.533**							**G**	**H**		**J**
Tec_Asi1	**15**	**2.533**							**G**	**H**		**J**
Cad_Adc1	**15**	**2.333**								**H**		**J**
Cap_Inv1	**15**	**2**										**J**
Cap_Inv2	**15**	**1.733**										**J**
Tec_Asi2	**15**	**1.733**										**J**

Stockings that don't share a letter are significantly different.



A single two-stage cluster is obtained, because, based on the questionnaires, all mango packing plants in Nuevo Urecho, Michoacán, have the variables studied under the same conditions.

Table 6.- It indicates that no packing house was excluded

		N	%
Cases	Valid	15	100
	Excluded	0	0
	Total	15	100

This table indicates that the fifteen mango packing houses were considered

Table 7.- Indicates of reliability statistics

Cronbach's alpha	N of elements
0.92	48

This chart tells us that Cronbach's alpha of all variables is very good.

Results and discussion

It can be said that the results are similar to those found by Rodríguez, (2021), Parra, (2019) and Avalos, (2023), which calculated Pearson's Correlation Coefficient, where the bilateral Sig. is less than 0.05, in this study the bilateral Sig is greater than 0.05, in the same way they determined the linearity which was greater than 0.5, results that were also obtained in the present study, in such a way that the linearity was greater than 0.5, the same as in the present research, in this sense there is no problem.

For the analysis of variance, which refers to the comparison of means, the criteria of Johnson (1991) and Little (1985) were used, in addition to the Excel sheet, if a difference in means was found, obtaining several groups.

Conclusions

1.- There is no Pearson correlation between the independent variables, because the bilateral Sig. is greater than 0.05 see Table 1.

2.- It has no problems with linearity, because values greater than 0.50 are obtained see Table 2.

3.- If there is a difference between the means, the calculated F is greater than the tabulated F, therefore nine groups of means are formed, see Tables 3 and 4.

4.- A single Two-Stage Cluster is formed, see Table 5 - No baler is excluded, see Table 6

6.- Cronbach's Alpha (reliability) is very good, see box, see box 7.

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