

Trends in the Use of Symbiotics in Morocco During the Years 2020 and 2021

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ABSTRACT

Several studies have highlighted the importance of these 3 concepts, which are probiotics, prebiotics and symbiotic in daily clinical practice. They play an important role in the treatment/prevention of several diseases and contribute to the proper functioning of the digestive and immune systems. The objective of our study is to describe and compare the evolution of the use of symbiotic by the Moroccan population based on the sales rate between the year 2020 and 2021. Data collection was carried out by a means of a questionnaire concerning 15 symbiotic products most used by the Moroccan population. Our study suggests that some products have seen an increase in sales between 2020 and 2021, such as *Lactobacillus casei* which reached 95,500 products in 2021 instead of 69,500 products in 2020, while the sale of the products decreased such as *Bifidobacterium longum* which reached 0 products in 2021 instead of 300 products in 2020, and according to the student test there is a significant difference between the average sales during the two successive years of 2020 and 2021 ($p = 0,037$). Our results show that the consumption and the use of symbiotic products by Moroccan population have shown significant differences.

Keywords: symbiotic, prebiotics, probiotics, sales, Moroccan population.

INTRODUCTION

Symbiotic are synthetic food products that contain both probiotics and prebiotics (Gibson and Roberfroid., 1995). The main role of this combination is to maintain a healthy intestinal microbiota (Rioux et al., 2005). Probiotics are living microorganisms that, when ingested in adequate quantity, have beneficial effects on health (Hill et al., 2014). Among the microorganisms most commonly used as probiotics are: *Lactobacillus* and *Bifidobacterium*, some species of *E. coli* and *Bacillus* and the yeast *Saccharomyces cerevisiae* (Kim et al., 2019; Zawistowska-Rojek and Tyski., 2018). Probiotics must be neither toxic nor pathogenic, and

must resist gastric, biliary and pancreatic secretions to remain alive in the small intestine and colon (Doron and Snyderman., 2015). Several studies suggest that probiotics play important roles in human health, such as regulating the immune response, rebalancing the intestinal flora and preventing certain diseases and cancer (Markowiak and Śliżewska., 2017). Prebiotics are defined as non-digestible substances capable of exerting multiple positive virtues in humans, they stimulate the growth and activity of certain microbial species (Gibson and Roberfroid., 1995). The best-known are: inulin, oligofructose, galacto-oligosaccharides, lactulose (Fan et al., 2016; Vandenplas et al., 2015; Cloas-Monasterolo et al., 2013).

In addition, probiotic-prebiotic couples are currently being tested. For example, the case for the combination of *Bifidobacteria/fructo-oligosaccharides*, *Lactobacilli/Lactitol* or *Bifidobacteria/galacto-oligosachharides*.

Our work consists to describe the evolution of the use of symbiotic by the Moroccan population during two successive years 2020 and 2021 based on the growth rate of sales of these products.

MATERIAL AND METHOD

Data collection

This cross-sectional study was based on several types of symbiotic products. The data concerned the increase in sales throughout the Moroccan territory during the two consecutive years 2020 and 2021. Data collection was based on a questionnaire distributed by IMS (information management system) and completed by the marketing authorization holder in Morocco territory (Table 1).

Statistical analysis

The mean comparison between the sales of the symbiotic was evaluated by the Student test t. Any association with $p < 0.05$ was considered statistical significant. The data analysis was entered and performed using the Statistical Package for the Social Science (SPSS) (software version 22.0).

RESULTS

The evolution of sales of symbiotic products during 2020 and 2021

According to the results obtained in Figure 1, we observed an increase in the sales of products P1 (*Corn starch, capsule shell...*), P2 (*fructoolligosacharide...*), P3 (*Lactobacillus-casei...*), P4 (*Fiber...*), P5 (*Bifidobacterium lactis...*), P6 (*Rhubarb...*), P8 (*Ocidilactici...*), P9 (*Lactobacillus rhamnosus...*), P12 (*Cellulose...*), on the other hand, a decrease in the sales of products P7 (*Bifidobacterium longum...*), P10 (*Lactobacillus helveticus...*), and lack in the sales of products P11 (*Vitamin D...*), P13 (*Bulking agent...*), P14 (*Citral...*), P15 (1g of active substance contains: *Enterococcus faecium* – 300 mg...).

The relationship between the sales of symbiotic in the years 2020 and 2021

According to the student test t, the results show that there is a significant difference between averages of sales during the 2 successive years of 2020 and 2021 with $p = 0.037$ (Table 2).

The rate of change in sales between 2021 and 2022 (thousands of Dirhams)

The percentage variation in sales between 2020 and 2021 is shown in figure 2. We observed that P5 was predominant with 88% of the overall products, followed by P5 with 85% and P12 with 65%. Inversely, P11, P13, P14, P15 presented 0% of the overall market.

DISCUSSION

The oral consumption of microorganisms as beneficial agents for human health has fascinated humanity for many centuries. The concept of probiotics was defined in the first time by Ferdinand Vergin in 1954 (Markowiak and Śliżewska., 2017). Products containing probiotics have recently known a great commercial success in Europe, in Asia and in other parts of the world. This progress will stimulate the consumption and development of the product.

The results of the study showed that there is a difference in sales between the symbiotic products. Some products have seen an increase in sales between 2020 and 2021, as *Lactobacillus casei* which reached 95,500 products in 2021 instead of 69,500 products in 2020, while the sale of the products decreased such as *Bifidobacterium longum* which reached 0 products in 2021 instead of 300 products in 2020, and the major rate in the market is occupied by *Bifidobacterium lactis* with a sale rate reaching 88% of total sales in the Moroccan product.

The European population consumes probiotics in food and in food supplements. The consumer market for probiotic products is worth > 1,4 billion euros in Western Europe (Saxelin., 2008). The consumption of yoghurts and desserts is the most important, which sales of 1 billion euros. Thus, the food supplements have an estimated activity of 10% of total probiotic market.

A study in the Japan revealed that the sale of probiotic products has grown exponentially, US\$5.3 billion in 2005 instead \$1.12 billion in

Table 1. Symbolization of symbiotic products in this study with their dates of initial sales on the Moroccan market

Trade name	Symbol of symbiotic in the study	Date of initial sales in the Moroccan market
Corn starch; capsule shell: hydroxypropylmethylcellulose; bacterial strain <i>Bifidobacterium infantis</i> (strain 35624 [®]); anti-caking agents: magnesium salts of fatty acids, magnesium stearate of fatty acids; saccharose, trehalose*; stabilizing agent: sodium citrate	P1	01/2018
<i>fructooligosacharides</i> 958.2 mg/sachet + <i>Lactobacillus casei</i> (PXN [®] 37TM) ; <i>Lactobacillus rhamnosus</i> PXN [®] 54TM); <i>Streptococcus thermophilus</i> PXN [®] 66TM ; <i>Lactobacillus acidophilus</i> PXN [®] 35TM); <i>Bifidobacterium breve</i> PXN [®] 25TM ; <i>Bifidobacterium infantis</i> PXN [®] 27TM; <i>Lactobacillus bulgaricus</i> PXN [®] 39TM	P2	08/2012
<i>Saccharomyces boulardii</i> 282.5 mg per sachet	P3	06/2012
Fiber (<i>fructooligosaccharides</i> 25.4 mg), inulin (25.4 mg), <i>Lactobacillus helveticus</i> Rosell-52, <i>Lactobacillus helveticus</i> Lafti [®] L10, <i>Lactobacillus rhamnosus</i> Rosell-11, <i>Bifidobacterium longum</i> Rosell-175, vitamin D3 (0.75 µg).	P4	08/2010
<i>Bifidobacterium lactis</i> , <i>Bifidobacterium bifidum</i> , <i>Bifidobacterium infantis</i> , <i>Bifidobacterium breve</i> , <i>Lactobacillus acidophilic</i> , <i>Lactobacillus brevis</i> , <i>Lactobacillus casei</i> , <i>Lactobacillus plantarum</i> , <i>Lactobacillus rhamnosus</i> , <i>Lactobacillus salivarius</i> , <i>Lactobacillus lactis</i> <i>Streptococcus thermophilus</i> , <i>Saccharomyces boulardii</i> , <i>Bacillus coagulans</i> , <i>fructo-oligosaccharides</i> (<i>Actilight</i>), <i>inulin</i> , <i>corn maltodextrin</i> (<i>bulking agent</i>), <i>hydroxymethylcellulose</i> (<i>coating agent</i>), <i>magnesium stearate</i> , <i>silicon oxide</i> (<i>anti-caking agent</i>), <i>gelan gum</i> (<i>thickener</i>).	P5	10/2017
<i>Rhubarb</i> , <i>guimauve</i> , <i>Pale Pink</i> , <i>Artichoke</i> (<i>support: maltodextrine, antioxydant : acide citrique</i>), <i>Basil</i> , <i>Coriander</i> , <i>yeast</i> , <i>anti-caking agent: tricalcium phosphate</i> ; <i>potato dextrin</i> , <i>lactic ferments</i> (<i>support : maltodextrin</i>): <i>Bifidobacterium bifidum</i> , <i>Lactobacillus acidophilus</i>	P6	08/2017
<i>Bifidobacterium longum</i> LA101 <i>Lactobacillus helveticus</i> LA102 <i>Lactococcus lactis</i> LA103 <i>Streptococcus thermophilus</i> LA104	P7	03/2010
<i>Lactobacillus plantarum</i> CECT 7484, <i>Lactobacillus plantarum</i> CECT 7485, <i>Pediococcus acidilactici</i> CECT 7483, <i>Excipients: maltodextrin, silicon dioxide, magnesium stearate, hydroxypropyl methylcellulose, titanium dioxide.</i>	P8	09/2018
<i>Lactobacillus rhamnosus</i> GG <i>Bifidobacterium lactis</i> + <i>Tormentil root</i> <i>Excipients: maltodextrin, hypromellose (capsule); microcristalline cellulose; titanium dioxide (colorant) ; magnesium stearate(anticlotting agent).</i>	P9	04/2019
<i>Bifidobacterium longum</i> LA101, <i>Lactobacillus helveticus</i> LA102, <i>Lactococcus lactis</i> LA103, <i>Streptococcus thermophilus</i> LA104, <i>Lactobacillus Rhamnosus</i> LA801, <i>Vitamine D</i>	P10	03/2010
<i>Lactobacillus rhamnosus</i> R0011 <i>Lactobacillus helveticus</i> R0052, <i>Vitamine D</i>	P11	06/2016
<i>Bulking agent: cellulose; Lactobacillus acidophilus, Lactobacillus plantarum, Bifidobacterium lactis, Bifidobacterium breve; anti-caking agent: magnesium salts of fatty acids.</i>	P12	01/2010
<i>sweetener (xylitol), Lactobacillus reuteri</i> DSM 17938; <i>Lactobacillus reuteri</i> <i>Protectis</i> , <i>vitamin D3</i> 20 µg + <i>flavor enhancer: citric acid.</i>	P13	06/2014
<i>Lactobacillus fermentum;</i> <i>Lactobacillus delbrueckii.</i> <i>*Fermented culture Lactose monohydrate, casein peptone, yeast extract, sodium acetate trihydrate, dipotassium phosphate anhydrous.</i> <i>*Excipients: hydrated colloidal silica, talc, magnesium stearate, anhydrous lactose.</i> <i>*Lyophilization adjuvants: lactose monohydrate, calcium carbonate.</i> <i>*colorant (capsule): titanium dioxide</i>	P14	unknown
<i>Lactobacillus acidophilus</i> (DSM 13241); <i>Bifidobacterium animalis subsp. lactis</i> (DSM 15954), + <i>Oligofructose</i> , <i>* bulking agent: cellulose, potato starch,</i> <i>* humectant: fatty acids.</i>	P15	06/2013

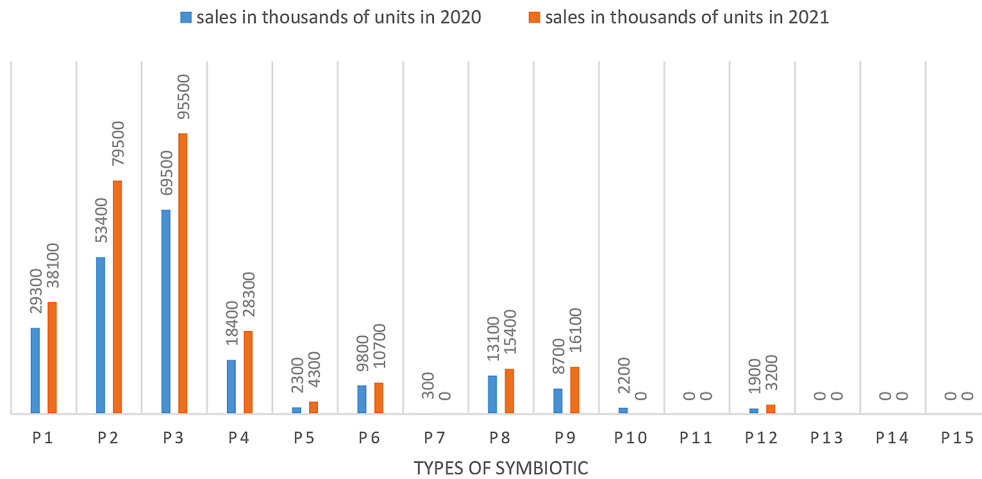


Figure 1. The evolution of sales of symbiotic products during 2020 and 2021

Table 2. The relationship between the sales of symbiotic in the years 2020 and 2021

Year	N	Moy / Et	P
Sales in thousands of units in 2020	15	13926.66 ± 21258.19	0.037
Sales in thousands of units in 2021	15	19346.66 ± 30132.15	

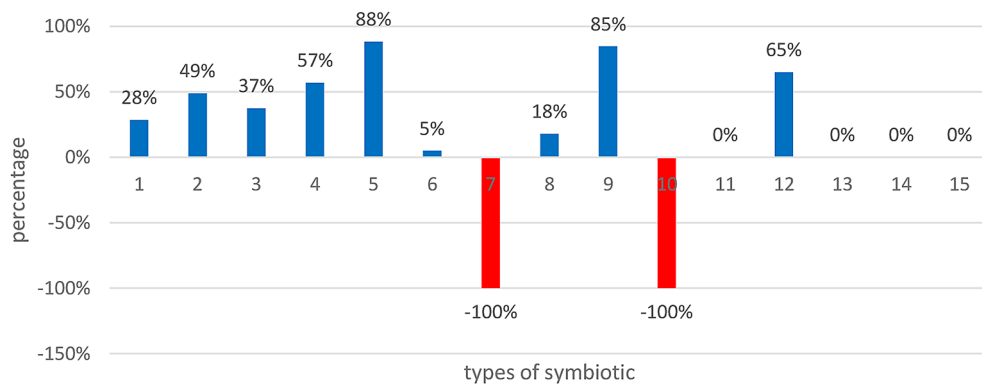


Figure 2. The rate of change in sales between 2021 and 2022 (thousands of Dirhams)

1997 (Ohama and Ikeda., 2006), additionally, some Japanese hospitals used probiotics for treating gastrointestinal disorders, and symptoms related to antibiotic use (Amagase., 2008).

According to the report revealed by WHO and FAO in November 2018, the global market for probiotic ingredients was valued \$1,5 billion in 2016 and is expected to reach \$2,15 billion by 2021 (Bornes., 2020). In the same sense, a market research report on probiotics in France for the period of October 2018 to September 2019 revealed that sales of probiotic products increased from about 54 million euros in the period of October 2017 to September 2018 to about 60 million euros in the period of October 2018 to September 2019. That is an increase of about 11% in just 1 year (Bornes., 2020).

CONCLUSION

The consumption and the use of symbiotic by the Moroccan population have shown significant differences. It is necessary to concentrate the efforts between all the institutions for the sensitization and the awareness by the population on the benefits of probiotics, the consideration of the socio-economic criteria of the person and the facilitation of the conditions of importation and the marketing of the products.

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