Symbiotics are a combination of prebiotics and probiotics that positively affects the living organism by stimulating beneficial bacteria beneficial for health and thus improving production performance and well-being (Laice et al., 2021). Probiotics are living organisms, which when administered in adequate dose leads to a great benefit to the health of the host (Hill et al., 2014). A prebiotic is defined as a substance which is selectively consumed by the microorganisms of the host and which provides an extra value for the organism. Indeed, the prebiotics are substrates that are most often glucidic not digested by the small intestine and likely to modify the colonic ecosystem. The best studied are the fructooligosaccharids, inulin and galactooligosaccharids (Gibson et al., 2017).

The studies have established the benefits of probiotics on a large number of pathologies including inflammatory bowel disease, irritable bowel syndrome, infectious diseases, vaginal infections and immune enhancements (Boumekah et al., 2013).

This work consists in evaluating the increase of the sales and the use of the symbiotic by the Moroccan population during two successive years in order to describe the status of sale of this type of medicine.
MATERIAL AND METHOD

Data collection

The 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 2018 and 2019. 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 results are expressed as a percentage of market share and in sales units. The mean comparison between the sales of the symbiotic was evaluated by the Student test t. The test was considered significant if the p value <0.05. The data were entered and analyzed using the Statistical Package for the Social Science (SPSS) (software version 17.5) and SAS (Statistical Analysis System) 9.3 for Duncan test.

RESULTS

The evolution of sales of symbiotic products during 2018 and 2019

According to the results obtained in Figure 1, we observed an increase in the sales of products P1 (Corn starch, capsule shell...), P5 (Bifidobacterium lactis..) and P6 (Rhubarb; Coriander...) and a decrease in the sales of products P2 (fructooligosacharides...), P4 (Lactobacillus helveticus Rosell-52...), P7 (Bifidobacterium longum...), P8 (Ociddilactici CECT 7483...), P9 (Lactobacillus rhamnosus...), P10 (Bifidobacterium longum...), P11 (Lactobacillus rhamnosus R00...), P12 (Bulking agent: cellulose...), P13 (Bulking agent (isomalt)...) and P14 (Sucrose, Sorbitol...) during the year 2019 compared to the sales of these products in 2018.

According to the Student test t, we noticed that there is no significant difference between averages of sales during the two successive years of 2018 and 2019 with p = 0.496 (Table 2).

The Duncan test (Fig. 2) revealed five statistical groups: a, ab, abc, bc and c and allowed us to see that the symbiotic product P3 falls into group (ab) with an average of 41.1 followed by the P2 and P5 which are located in group (abc) with a maximum average 32.5 and then the products P4, P6, P7, P8, P9, P10, P11, P13, P14 and P15 are in group (bc) then the product P1 is in group (a) with an average of 6.05 and finally the product P12 is in group (c) with an average of -9.55.

The share of sales of the products of the study in the Moroccan market

Results showed that P3 was predominant with 6.1% of the overall market, followed by P2 with 5% and P1 with 2.5% while P10, P13, P14 and P15 do not count with 0% of the overall market (Table 3).

![Figure 1. The evolution of sales of symbiotic products during 2018 and 2019](image-url)
<table>
<thead>
<tr>
<th>Trade name</th>
<th>Symbol of symbiotic in the study</th>
<th>Date of initial sales in the Moroccan market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn starch; capsule shell: hydroxypropylmethylcellulose; bacterial strain Bifidobacterium infantis (strain 35624®); anti-caking agents: magnesium salts of fatty acids, magnesium stearate of fatty acids; saccharose, trehalose*; stabilizing agent: sodium citrate</td>
<td>P1</td>
<td>01/2018</td>
</tr>
<tr>
<td>fructooligosacharides 958.2 mg/sachet + Lactobacillus casei (PNX<em>37 TM); Lactobacillus rhamnosus PNX</em>54 TM; Streptococcus thermophylus PNX<em>66 TM; Lactobacillus acidophilus PNX</em>35 TM; Bifidobacterium breve PNX<em>25 TM; Bifidobacterium infantis PNX</em>27 TM; Lactobacillus bulgaricus PNX*39 TM</td>
<td>P2</td>
<td>08/2012</td>
</tr>
<tr>
<td>Streptococcus thermophilus, Lactobacillus casei, Lactobacillus acidophilus, Lactobacillus bulgaricus, Bifidobacterium longum, Bifidobacterium bifidum, Lactobacillus rhamnosus</td>
<td>P3</td>
<td>06/2012</td>
</tr>
<tr>
<td>Fiber (fructooligosacharides 25.4 mg), inulin (25.4 mg), Lactobacillus helveticus Rosell-S2, Lactobacillus helveticus Lafti®L10, Lactobacillus rhamnosus Rosell-11, Bifidobacterium longum Rosell-175, vitamin D3 (0.75 µg). For 1 sachet: Lactobacillus helveticus Rosell-S2, Lactobacillus helveticus Lafti®L10, Lactobacillus rhamnosus Rosell-11, Bifidobacterium longum Rosell-175, vitamin D3 (2.5 µg).</td>
<td>P4</td>
<td>08/2010</td>
</tr>
<tr>
<td>Bifidobacterium lactis, Bifidobacterium bifidum, Bifidobacterium infantis, Bifidobacterium longum, Bifidobacterium breve, Lactobacillus acidophilic, Lactobacillus brevis, Lactobacillus casei, Lactobacillus plantarum, Lactobacillus rhamnosus, Lactobacillus salivarius, Lactobacillus lactis Streptococcus thermophilus, Saccharomyces boulardii, Bifidobacterium lactis, fructo-oligosacharides (Actilight), inulin, corn maltodextrin (bulking agent), hydroxymethylcellulose (coating agent), magnesium stearate, silicon oxide (anti-caking agent), gelan gum (thickener), milk derivative</td>
<td>P5</td>
<td>10/2017</td>
</tr>
<tr>
<td>Rhubarb; Coriander, Basil; Pale Pink; Artichoke; Marshmallow; Yeast; Lactic Ferments; Maltodextrin; Silica; Talc; Potato Dextrin</td>
<td>P6</td>
<td>08/2017</td>
</tr>
<tr>
<td>Bifidobacterium longum LA101, Lactobacillus helveticus LA102, Lactococcus lactis LA103, Streptococcus thermophilus LA104</td>
<td>P7</td>
<td>03/2010</td>
</tr>
<tr>
<td>Ocidilactici CECT 7483, Lactobacillus plantum CECT 7484 et Lactobacillus plantarum CECT 7485</td>
<td>P8</td>
<td>09/2018</td>
</tr>
<tr>
<td>Lactobacillus rhamnosus Bifidobacterium lactis Excipients: maltodextrin, hypromellose (capsule); microcrystalline cellulose; titanium dioxide (colorant); magnesium stearate (anti-caking agent).</td>
<td>P9</td>
<td>04/2019</td>
</tr>
<tr>
<td>Bifidobacterium longum LA101, Lactobacillus helveticus LA102, Lactococcus lactis LA103, Streptococcus thermophilus LA104, Lactobacillus Rhamnosus LAB01, Vitamine D</td>
<td>P10</td>
<td>03/2010</td>
</tr>
<tr>
<td>Lactobacillus rhamnosus R0021, Lactobacillus helveticus R0052, Vitamine D</td>
<td>P11</td>
<td>06/2016</td>
</tr>
<tr>
<td>Bulking agent: cellulose; capsule of vegetable origin (cellulose derivative); Suprabiotique® complex; Lactobacillus acidophilus, Bifidobacterium lactis, Lactobacillus plantarum, Bifidobacterium breve; anti-caking agent: magnesium salts of fatty acids. This product contains ingredients from wheat, soy and milk</td>
<td>P12</td>
<td>01/2010</td>
</tr>
<tr>
<td>Bulking agent (isomalt), sweetener (xylitol), Lactobacillus reuteri DSM 17938 (Lactobacillus reuteri Protectis), flavor, cholecalciferol ([vitamin D 20 µg (800 IU) for tablets with vitamin D], flavor enhancer: citric acid.</td>
<td>P13</td>
<td>06/2014</td>
</tr>
<tr>
<td>Active substance : Inactivated Lactobacillus LB Common excipients: Silicic acid, Calcium carbonate, Lactose monohydrate Other excipients (specific to certain forms): Acetaldehyde, Ethyl acetate, Ethyl butyrate, Citral, Water, Eugenol, Gelatin, Geranyl formate, Glucose, Vegetable gum, Isoamyl acetate, Isoamyl isovalerate, Linalool, Magnesium stearate, Maltodextrin, Orange-banana flavor, Orange essence, Orange juice, Sucrose, Sorbitol, Talc, Terpineol, Titanium dioxide</td>
<td>P14</td>
<td>unknown</td>
</tr>
<tr>
<td>1 g of active substance contains: Enterococcus faecium - 300 mg; Bifidobacterium infantis - 300 mg; Lactobacillus acidophilus (L.gasseri species) - 300 mg; Potato starch - 50 mg; Lactose - 50 mg.</td>
<td>P15</td>
<td>06/2013</td>
</tr>
</tbody>
</table>

* refers to: Magnesium stearate. The composition of the capsule shell: gelatin, propylhydroxybenzoate, methylhydroxybenzoate, titanium dioxide (E171).
From the results of Table 4 we observed that P1 was predominant with 10.3% of the overall market despite not being the leader in sales units, followed by P2 with 8.3% and P3 with 6%. Conversely, P13, P14 and P15 represent 0% of the overall market.

The history of probiotics began several centuries ago. The consumption of fermented milk, for example, is a way of using prebiotics for their health. Henry Tessler is the first researcher who demonstrated the presence of bifidobacteria in the digestive tract of an infant in 1899. (Islam, 2016) The field of use of probiotics is increasingly wide and its use is gradually increasing. In
fact, since the beginning of the twentieth century Metchnikoff (Metchnikoff 1908) has shown the beneficial effects of fermented milk and lactic acid bacteria on health, using the probiotics initially to treat gastrointestinal diseases such as diarrhea and infections resulting from *Clostridium difficile* (Butel, 2014).

This study suggested that the sale of the symbiotic products was fluctuated. The sale of certain products increased such as *corn starch* which reached 96,000 products in 2019 instead of 27,800 products in 2018, while the sale of the products decreased such as *fructooligosaccharides* and which reached 55,000 products in 2019 instead of 10,000 products in 2018 and the major share in the market is occupied by *corn starch*, with a sale rate reaching 10, 30 % of total sales in the Moroccan market.

A study in the United States revealed that the sale of probiotic products has grown exponentially, and between 2007 and 2013 the sale of probiotic products reached $19.6 billion in 2013 (Agheyisi, 2008).

A Euromonitor report revealed that in China the sales of the symbiotic used to make dairy yogurt reached $ 4.994564 in 2014 (Ewa Hudson, 2014) and the other study shown that it has more than 3000 industrial types of probiotic unit products, 559 of which are foreign companies located in China, which enrich the market with more than 10,000 different probiotic products. In the United States of America, the market for probiotics has also undergone an increasing evolution due significant knowledge and acceptance of the American population of the benefits of these products (Basu et al., 2017). Further, in 2014 the revenues from American sales of probiotics reached 1.1 billion dollars (Raghuwanshi et al., 2015).

According to a study, the international demand for probiotics was 27.9 billion dollars in 2011 and will reach 44.9 billion dollars in 2018 Asia-Pacific and Europe (Statista, 2016).

In India, probiotics have been widely used in the veterinary field as food supplements. However, their use in human medicine remains limited (pediatrics only mainly in the form of *lactobacillus* suspension) (Sharma et al., 2013).

The evolution of sales in our study perhaps came due to the impact of the Covid-19 pandemic in Morocco which requires further investigation and other more recent studies should be undertaken in order to be able to perceive the evolution of consumer awareness of the benefits of symbiotic that would be reflected in the increase in sales.

**CONCLUSION**

The consumption and use of symbiotic in Morocco have experienced significant fluctuations. The slow and complicated administrative procedures of import and authorization, combined with poor management of promotion and distribution in the medical and pharmaceutical channels, could be the origin of the decline in sales. Further comparative studies are still needed to improve the state of sales and use of symbiotic products of proven healing benefits.

**REFERENCES**


