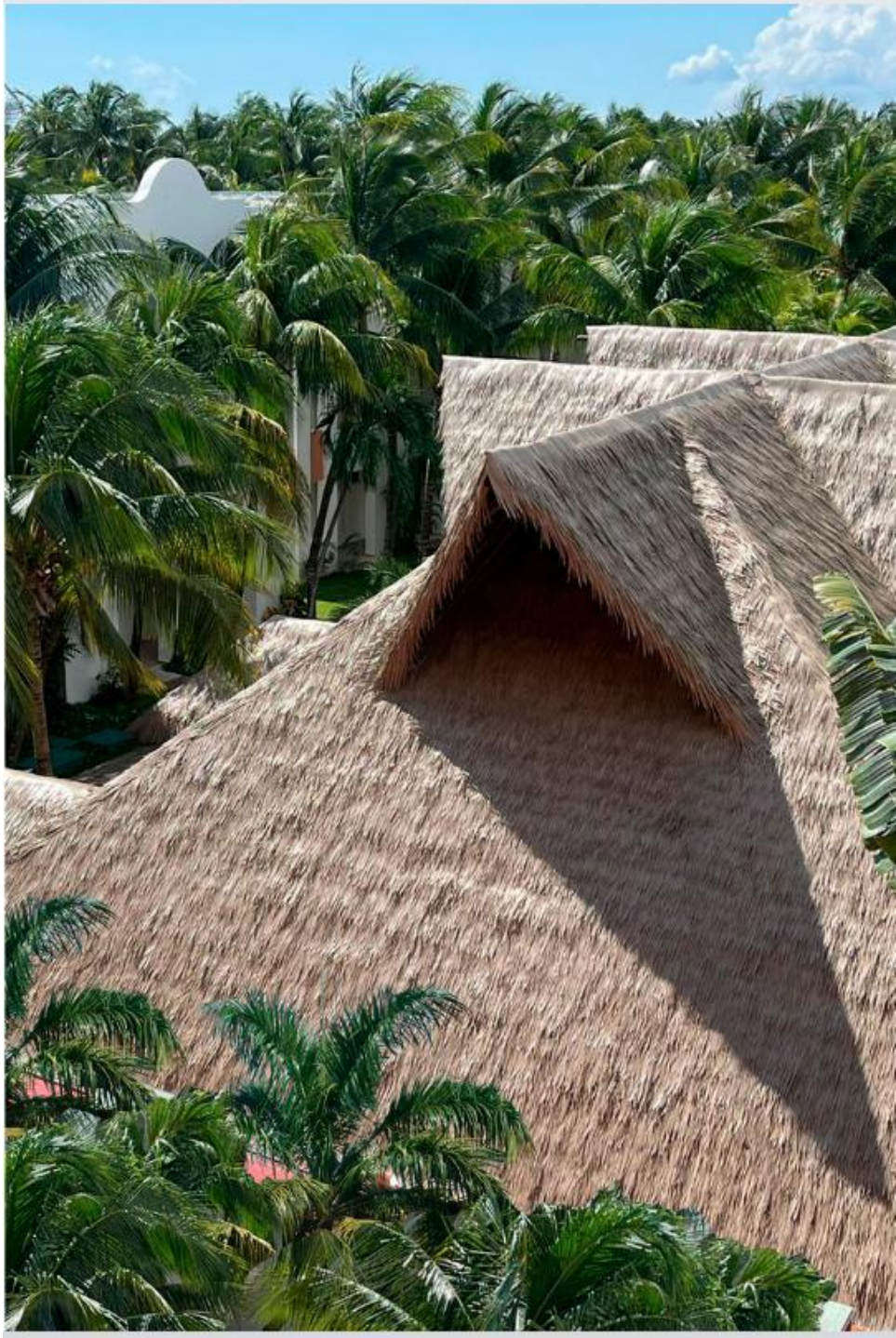
PALAPAS
SINTÉTICAS
DE MÉXICO

EFFECTS OF FIRE ON THE SYNTHETIC PALM

HECHO EN CANCÚN



PROLOGUE

Palapas constructed with organic materials of plant origin, such as palm or natural thatch, are highly flammable.

Residues from fireworks, embers from grills, and cigarette butts are some of the most common causes of accidental palapa fires. When this occurs, the fire can spread so rapidly that, in a matter of seconds, enormous palapas, even those belonging to well-known hotels, can be completely consumed, leaving little time to react. Furthermore, the glowing embers released during the fire can be carried by the wind and, upon contact with an adjacent palapa, cause the fire to spread even further. In addition, the smoke and gases generated during the combustion of these materials are highly harmful to those who inhale them.

A short circuit or direct exposure to a heat source or flame can also cause large-scale fires.

SYNTHETIC PALM

In response to the risks posed by highly flammable organic materials, synthetic palm has emerged on the market as a safer alternative, incorporating chemical substances with fire-inhibiting properties that help reduce the spread of fires.

However, the indiscriminate or improper use of these chemical substances can have serious consequences, including:

A decrease in oxygen concentration and the generation of toxic and asphyxiating gases, such as carbon monoxide, hydrochloric acid, ammonia, arsenic, carbon dioxide, and cyanide, among others;

The rapid dispersion of smoke and hot gases in the affected area, which makes breathing difficult and can cause severe burns to the lungs and respiratory tract, even leading to death.

Therefore, it is essential to maintain a rational and balanced use of these chemical substances, so that, when exposed to a heat source—such as fire—they do not generate risks that could affect the health of any living being. Consequently, two fundamental requirements must prevail:

- **Prevent the heat source from spreading the fire, allowing more time to evacuate the area and facilitating firefighting efforts.**
- **Prevent endangering the health of people and other living beings by minimizing the dense smoke and toxic gases generated when the material is exposed to fire.**

Based on these parameters, we set out to find specific solutions for each scenario, considering that the heat generated by accidental causes is not of the same magnitude as the heat produced when an intentional fire is started.

Considering that not all risks are the same, we identified the need to design two different levels of protection in the manufacture of the synthetic palm, tailored to the different types of heat sources. This is because the most frequent risk is found in everyday causes, and not necessarily in extraordinary situations.

After developing multiple formulations and conducting various tests with different raw material compositions, we exposed both natural palm and two different synthetic palm formulations we developed to various heat sources—such as cigarette butts, charcoal embers, and finally, direct flame from a blowtorch—in order to evaluate their behavior under real and extreme conditions.

The behavior of the three materials evaluated differed, yielding the following results:

BEHAVIOR IN FIRE OF NATURAL AND SYNTHETIC PALM			
Causes of fire	**Natural palm**	**Synthetic spark-resistant palms**	**Reinforced synthetic palm with fire retardant**
Sparks or debris from fireworks	It ignites in a matter of seconds and the fire spreads rapidly	It does not combust and only slightly damages the area where the sparks, balloon, or cigarette made contact.	
Glowing embers from charcoal grills			
Remnants of sky lanterns			
Cigarette butts			
Glass ashtrays exposed to sunlight creating a magnifying glass effect			
Short circuit			
Direct flame		After approximately 30 seconds, it combusts in the area where it receives the heat source, similar to the way a candle burns, dripping the plastic material and the fire spreading very slowly.	It does not combust after being heated with a torch. The flame goes out when the heat source is removed.
Smoke produced by the fire	Dense and abundant black smoke	Light, not abundant, black smoke, without a pungent odor	Light, not abundant, grayish smoke, without a pungent odor

As a result of these tests, it was possible to verify the high vulnerability of the natural palm, since it exhibited rapid combustion in response to all heat sources to which it was exposed.

In contrast, the synthetic palm thatch—**both the spark-resistant version and the fire-retardant-reinforced version**—did not combust. Only slight surface damage was observed in the contact area when exposed to pyrotechnic residue and embers or glowing coals, which are the most frequent causes of fires in natural thatched roofs, since none of these elements reach the thermal intensity necessary to ignite the synthetic palm.

When the synthetic palm was subjected to an extreme test, applying direct flame with a blowtorch to simulate an intentional attempt to start a fire, different behaviors were observed among the developed formulations:

The synthetic spark-resistant palm frond took a long time to ignite and, once ignited, burned slowly, similar to the behavior of a candle.

The synthetic palm frond reinforced with fire retardant withstood more than 12 continuous minutes of direct exposure before exhibiting light combustion, and when it did occur, the flame tended to extinguish itself naturally.

Even in this severe scenario, a considerably lower reduction in smoke and gases was observed compared to that released by natural palm fronds during combustion, which translates to a lower risk of poisoning from inhaling toxic fumes and gases.

When comparing them with some synthetic palms circulating on the market, we observed that for 30 seconds they were subjected to direct fire with a blowtorch and then the torch was removed in order to verify the time it took for the generated flame to extinguish. Some took longer than others, but none of those participating in the test intensified the fire, nor did it spread it, remaining static in the area where the blowtorch was directly applied. However, from the first moment they were exposed to the flame of the blowtorch, the synthetic palms released an abundant emission of smoke and gases.

By focusing on the material's resistance or the speed at which the flame is extinguished, these tests take a back seat to the importance of **the smoke density and the amount of toxic gases released** by the material being tested, even though they are highly harmful to the health of people and any living being.

The smoke and toxic gases generated during a fire can be as dangerous as, or even more dangerous than, the fire itself, due to the serious damage caused by inhalation and their ability to disperse rapidly. (Official sources from Fire Departments worldwide)

It is uncommon for a palapa to be intentionally set on fire, and it is even less common for the intense flames of a fire to providentially extinguish themselves within 30 seconds, eliminating the danger (as happens with the blowtorch test).

Therefore, the fire resistance of synthetic palm thatch must be evaluated in direct comparison with the resistance of natural palm or reed, in order to objectively identify and assess their differences under real-world fire exposure conditions.

Some studies related to the devastating effects of the chemical substances contained in fire retardants when consumed by fire can be found at the following link:

https://ipen.org/sites/default/files/documents/ipen_flame_retardants_v1_5b-es.pdf

CONCLUSIONS

Natural thatch typically catches fire accidentally when, due to carelessness, negligence, or imprudence, it is exposed to the residue of fireworks, embers from grills, sparks from cakes, or cigarette butts. When this happens, the fire spreads with unusual speed. None of these heat sources has the intensity of a blowtorch, because the magnitude of that force would only result in a large-scale fire that would likely last more than 30 seconds.

Therefore, our analyses are based on comparative studies between natural palm and our synthetic palm. The objective is to develop formulations that delay combustion as much as technically possible and, at the same time, reduce the generation of smoke and gases harmful to health.

We are aware and convinced that there are no miracle products or indestructible materials. Virtually all products on the market that are subjected to intense fire, whether accidentally or intentionally, are consumed by flames that ravage everything in their path, even weakening and collapsing metal structures. Synthetic palm is no exception.

The intention behind highlighting these considerations is not to denigrate any manufacturer's products, but rather to encourage responsible action from all those who, in the course of their work, participate directly or indirectly in the manufacture, installation, or acquisition of materials.

To the best of our knowledge, there is no product on the market that includes a guarantee that covers its replacement in case of fire, except when such replacement is covered by a specific insurance policy against material damage.

For Palapas Sintéticas de México, it is of utmost importance to manufacture high-quality synthetic thatch that is durable, waterproof, and resistant to wind and inclement weather. It must be able to withstand heat sources that could accidentally cause a fire, or even intentional attempts, and in the event of combustion, ensure that the fire does not spread or intensify, allowing sufficient time to evacuate the area and facilitate fire control.

However, above all these benefits, **We prioritize protecting people's health**, seeking to avoid, as much as possible, the generation of toxic fumes and gases that could cause serious injury or even death by inhalation.

That is why we strive to minimize the generation of toxic fumes and gases.

Sincerely

Palapas Sintéticas de México, S.A.P.I de C.V.