



## THERAPEUTIC APPLICATIONS OF STINGRAY LEATHER

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### ABSTRACT

In the present investigation, an attempt has been made to use the stingray leather with denticles for the preparation of smart products that find potential therapeutic application involving foot and hand reflexology. A smart footwear, named as massage footwear was developed using stingray leather as insole material to provide acupressure effect to the person wearing the footwear. Foot scan analysis has been carried out to study the effect of foot pressure by massage footwear. We observed that massage (acupressure) effect was stimulated by the denticles of stingray leather. The leather with unique grain structure was also used for the preparation of novel products where the denticles impart better grip to the user and simultaneously stimulating the hand reflex zones during usage.

**Key words:** stingray, massage footwear, reflexology, foot massage

### INTRODUCTION

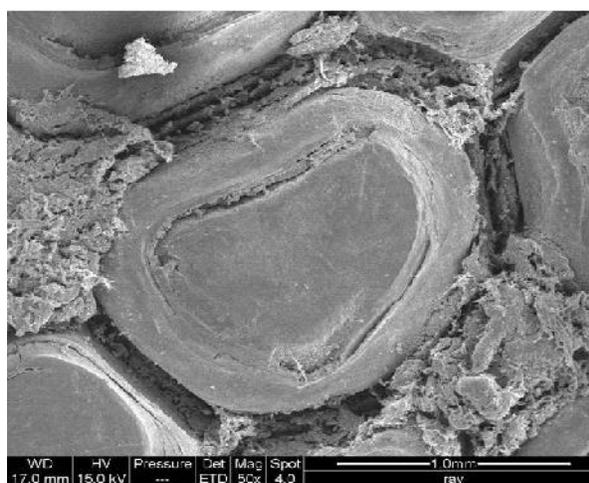
Reflexology is a science that deals with the human body and the flow of natural energy within the body (Tsay and Chen, 2003). Various organs of our body are connected by a network of nerves and end with certain spots or zones called as reflex zones. By stimulating the foot and hand reflex zones, functions of the target organs can be controlled by more intensive blood circulation flowing to the target organs, thereby enhancing the body energy and immunity (Harris, 1997). Applying pressure into these points can relieve imbalances by either stimulating or easing the energy flow (Sandifier, 1997). Traditionally fingers or thumbs are used to apply pressure to regulate

the energy. The present study was designed to practice the reflexology technique by using special leather made from stingray skin (Karthikeyan *et al.*, 2009, 2011).

Unlike many fish skins, the stingrays have denticles instead of scales. The stingray skin is calcified during the mature stage (Dean *et al.*, 2005), becoming very hard and tough and hence the skins are not generally consumed as food. The photographic picture of stingray skin with denticles is presented in Figure 1. Denticles are scattered in two distinct sizes with smaller denticles intermingled between larger denticles. The scanning electron microscope (SEM) image of stingray denticle is presented in Figure 2.



**FIGURE 1.** Stingray skin with denticles



**FIGURE 2.** SEM Image of Stingray Denticle

Applications of stingray leather



FIGURE 3. Insole from stingray leather

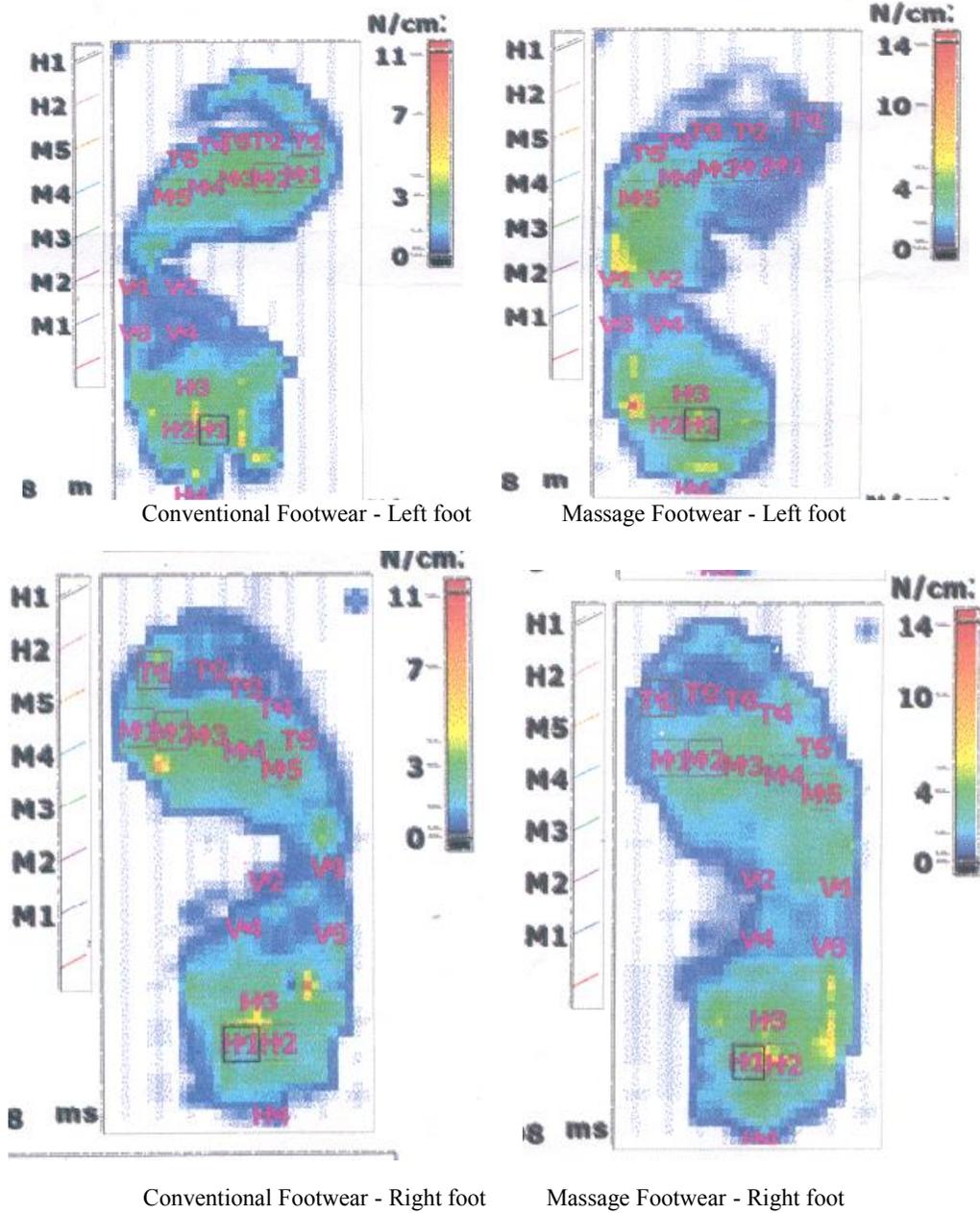


FIGURE 4. Parameters of foot scan analysis



**FIGURE 5.** Novel Products from Stingray Leather

To practice foot reflexology, a smart footwear named as massage footwear was developed using stingray leather as insole material. The stingray leather insole used for the preparation of massage footwear is presented in Figure 3. Conventional shoes are simply designed to protect the feet during walking, whereas massage footwear can improve the wearer's health by stimulating the foot reflex zones. The effect of massage footwear on foot pressure is presented in Figure 4. It shows the pattern generated by pressure measuring sensors during walking with massage and conventional footwear (cow leather as insole material). Different levels of pressure are indicated by different colors. The foot pressure is increased, where the dermal denticles present in stingray are larger in size (mid of the sole). In conventional footwear the top sole and /or the shoe liner is generally made up of a soft material to provide physical comfort and soft feel to the foot. In massage footwear stingray leather is used as top sole and the cylindrical denticles are used to stimulate the foot reflex zones during walking.

Apart from massage footwear, an attempt has also been made in CLRI to utilize the stingray leathers with unique grain structure for the preparation of outer covers for steering wheel, motor bike handle grips, tennis racket and cricket bat handle grips where the stingray leather imparts better grip to the user and these products could also be used to stimulate the reflex points in our palms. The novel products made out of stingray leather are presented in Figure 5. In summary, the unique grain pattern of stingray skin associated with denticles can be exploited to derive the therapeutic benefits due to the stimulation of reflex zones. The preliminary results are quite encouraging and the concept needs to be assessed in clinical studies

involving larger group of people to confirm the assessment.

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