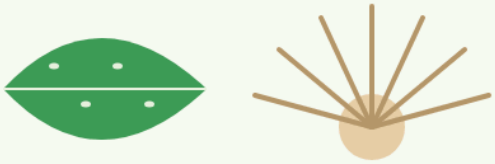
That is why

Why do cacti have spines instead of leaves?

Leaves leak water, so cacti rebuilt them as dead, pore-free spines and moved food-making into the green stem.

A From leaf to spine



Leaf | Spines on an areole

What it has	Leaf	Spine
Pores (stomata)	yes	none
Veins	yes	none
Green tissue	yes	none
Alive when grown	yes	no, all dead

A young spine looks just like a baby leaf and starts where a leaf should grow. Then leaf genes switch off and fiber genes switch on.

B The shaved cactus test

A computer model of a pincushion cactus, 9.4 cm tall, with and without its spines (Park Nobel, 1978).

Without spines, the surface got:

By day
2 to 6°C hotter

At night
1 to 2°C colder

The effect was even bigger at the growing tip, where new stem is made.

1 Night shift (CAM)

Its pores open only at night, when it is cool. It stores carbon dioxide and uses it once the sun is up.

C One net, many jobs

Shade
Spines cast speckled shade on the green stem.

Wind
They break up the drying winds across the stem.

Defense
Some are strong and painful; many are soft enough to chew.

Fog
One prickly pear catches fog with three-part spines.

Perhaps half of all cactus species live in shady rainforests, with only a few spines or very short ones.

Like a gardener's shade net, grown from the plant's own leaves.

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