

Double-bevel knives outperform single-bevel

It is interesting to contemplate the difference between the Japanese and European knife tradition. I've always heard that single-bevel knives cut better, but experimental data tell the opposite.

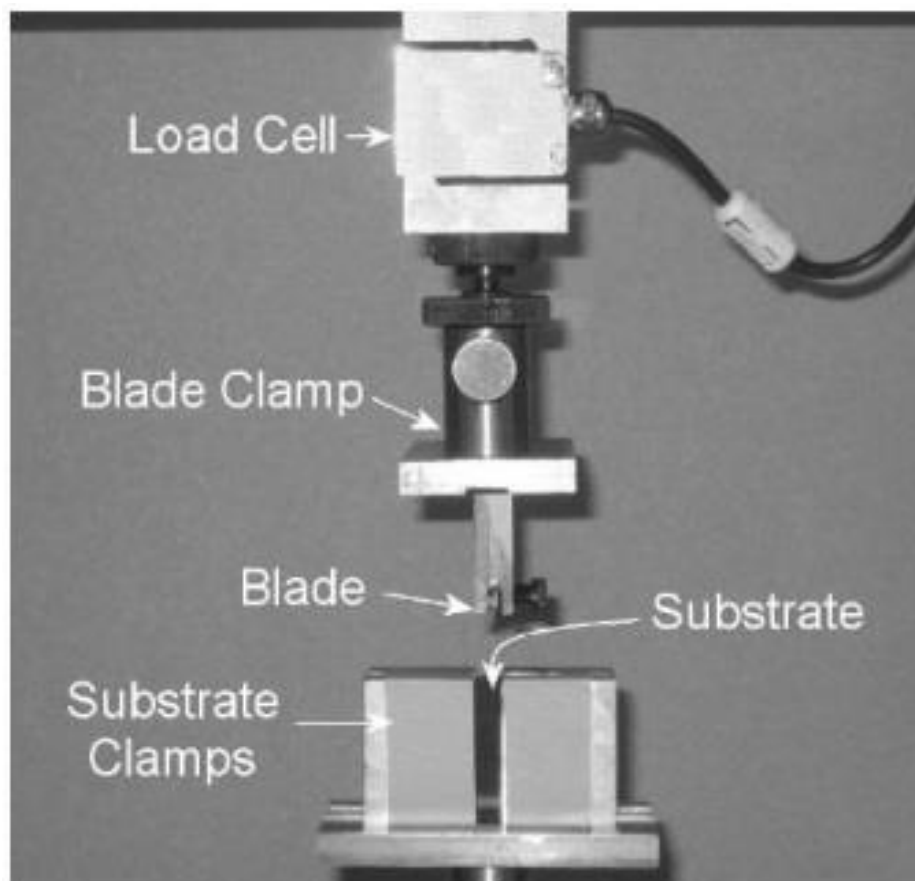
I've come across one 40 year old study:

Moore, M. A., F. S. King, P. F. Davis, and T. C. D. Manby. "The effect of knife geometry on cutting force and fracture in sugar beet topping." *Journal of Agricultural Engineering Research* 24, no. 1 (1979): 11-27.

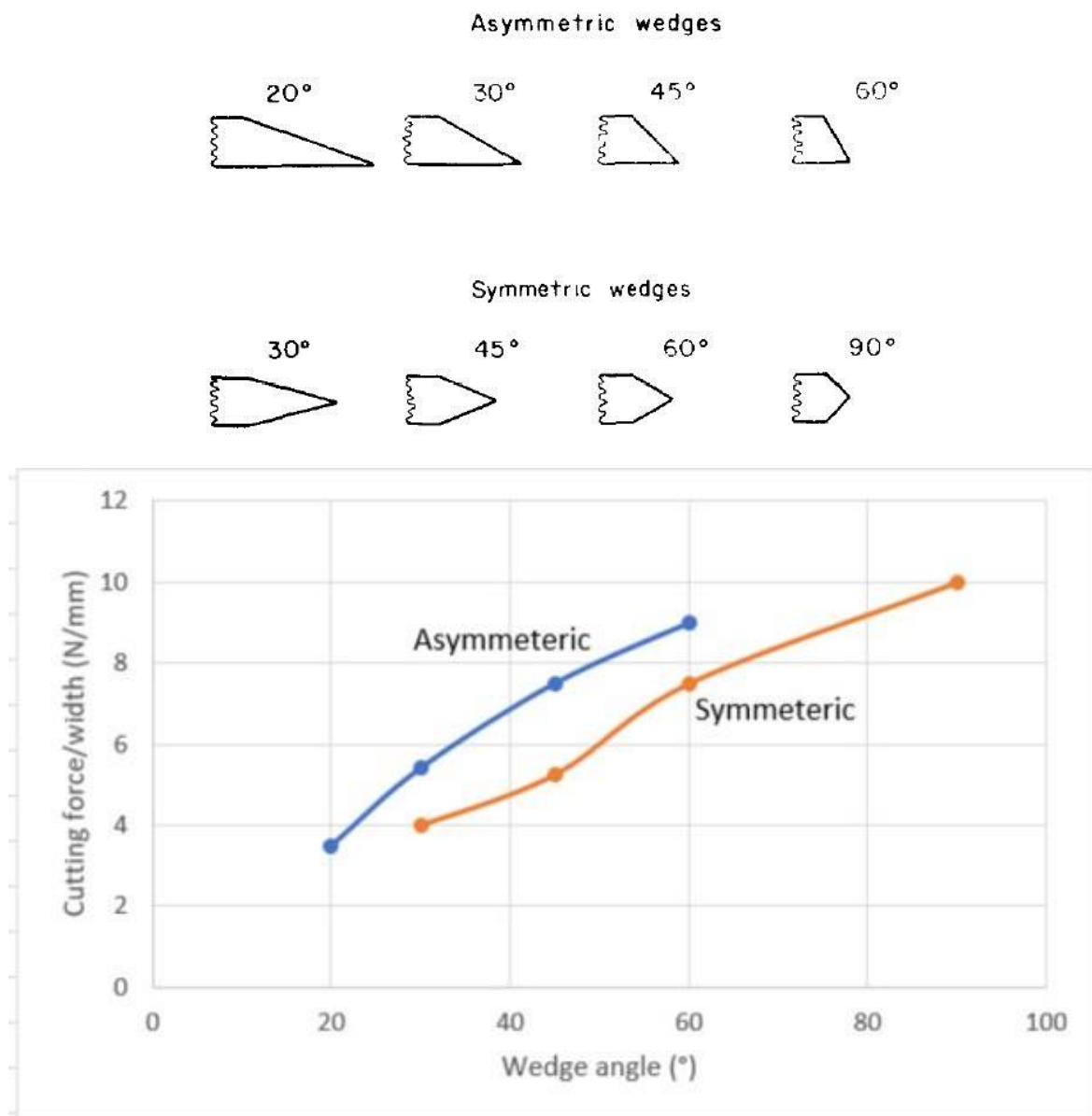
Force Required to Make a Cut

The force required for the complete cut is often referred to as "cutting ability".

The setup was similar to that on the picture, the force required to make a cut measured by the Load Cell.



A test was performed with beet topping using knives with either single bevel (asymmetric) or double bevel (symmetric) edge, with a range of edge angles:



The cutting force required for cutting through the beets increased with increasing edge angle, which wouldn't surprise us.

But the really interesting finding was that double bevel edges cut with less force at the same angle as the single bevel edges. Despite the similar sharpness (estimated by edge radius), the force required to cut through the beets was greater with a single-bevel edge.

Edge Rolling data by BESS SET

SET stands for Structural Edge Testing

The setup was similar to that on the picture.



These tests were conducted with A2 tool steel blades hardened to HRC58 and HRC62.

It has been our observation in the past that these chisel ground blades usually show rolling toward the flat side of the blade. Single-bevel blades are following the "path of least resistance" when rolling – a single-bevel blade will roll towards the less supported flat backside of the blade.

The below chart lists edge rolling of blades "chisel ground" at 30° as compared to double-bevel blades sharpened at 15 degrees per side, 30° included. Each blade was given the same number of controlled rolls on the SET tester, and then the edge sharpness tested on a PT50 BESS sharpness tester.

The higher the number, the worse is the edge rolling.

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SINGLE BEVEL BLADES

HRC	Initial Sharpness	POST SET	Total Roll (Post Set - Int. Sharp)
Flat Side Roll Direction			
HRC58	178	424	246
HRC62	169	399	230

DOUBLE BEVEL BLADES

HRC	Initial Sharpness	POST SET	Total Roll (Post Set - Int. Sharp)
HRC58	217	401	184
HRC62	201	384	183

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These data tell that single-bevel knives roll and blunt easier than double-bevel, and it makes sense since in the single-bevel blade edge is less supported on the flat backside, while the double-bevel edge has strong symmetric support on both sides.

SOURCE

<https://knifesteelnerds.com>

<http://www.bessex.com>