

Antitumor Material

SOLWEED™

Our SOLWEED has far stronger antitumor effect than other seaweed extracts, which was confirmed with tumor cell from various organs.

This product was developed as a food material under the cooperation of Faculty of Medicine, Nagoya University and Faculty of Pharmaceutical Sciences, Tokyo University of Science.

Characteristics of our SOLWEED

Our SOLWEED is a functional food material extracted from the mixture of Sporophyll of *Undaria pinnatifida* (*Mekabu*) and Norwegian kelp, *Ascophyllum nodosum* and spray-dried.

Two seaweeds are known to contain useful minerals and show activities such as anticoagulation and cholesterol level lowering. One of the ingredients, fucoidan has immuno-stimulating and antitumor effects. We, TOYO HAKKO, mixed two seaweeds in order to obtain synergistic effect.

The extract is highly heat-stable and best suited to beverage and pouch-packed food products, which need heat sterilization during manufacturing.

What are the two seaweeds?

Sporophyll of *Undaria pinnatifida* (*Mekabu*) is the thick part close to root and richer 20% in alginic acid, iodine and calcium than leaf and stem. It is also rich in EPA (highly unsaturated fatty acid), necessary for our health. Viscous and sticky material from *Mekabu* is sulfated polysaccharides called alginic acid and fucoidan. The latter is the ingredient recently spotlighted.

Ascophyllum nodosum, also called Algit, is a brown seaweed which grows in north Europe and closely related to *Hibamata* (*Fucus*) harvested in Japan. Dried algae is served as tea in Norway and is used for raw material of alginic acid (food additive), feed and fertilizer.

Both *Mekabu* and *Ascophyllum nodosum* are very important well-balanced nutritions and rich in minerals and essential element, iodine. Two times more calcium, five times more iron, above two times more vitamin A and fifteen times more vitamin E than those in *Kombu* (*Laminaria japonica*) are contained.

What is the main effective ingredient, Fucoidan?

Fucoidan is the general name for sulfated polysaccharides found in seaweeds and plants such as *Wakame*, *Mozuku* and *Kombu*, and it is consist of sulfated fucose, galactose, mannose, glucuronic acid, and xylose.

It is known that fucoidan encourages macrophages and natural killer (NK) cells deeply related to human immune system.

It has been shown to:

- Inhibit cancer
- Have antibacterial property
- Decrease triglyceride level
- Inhibit blood clotting

Prevention of hyperlipidemia, arteriosclerosis and so on are expected.

Quality specification

Product name	SOLWEED	Manufacturing process
Generic name	Seaweed extract	Raw material charge-in
Label Indication	Seaweed (<i>Ascophyllum nodosum</i> / <i>Mekabu</i>) extract. <i>Ascophyllum nodosum</i> / <i>Mekabu</i> , Seaweed extract. Seaweed extract of <i>Ascophyllum nodosum</i> / <i>Mekabu</i> .	
Usage	30mgs to 100mgs /day	Extraction
Standard package	1kg packed in aluminum bag , 60kgs in one carton box	Filtration
Use-by date	2 years from manufacturing date (in case bag is kept closed)	Concentration
Properties	Between light brown and brown powder, peculiar smell to seaweed	Pasteurization
Aerobic plant count	Not more than 3000 cfu/g	Spray drying
Coliform organisms	Negative	
Viable molds and yeasts count	Not more than 300 cfu/g	Sieving
Moisture	Not more than 10%	Packaging
Particle size	40 mesh pass	
Fucoidan content	Not less than 25% *	

*Fucose content equivalency



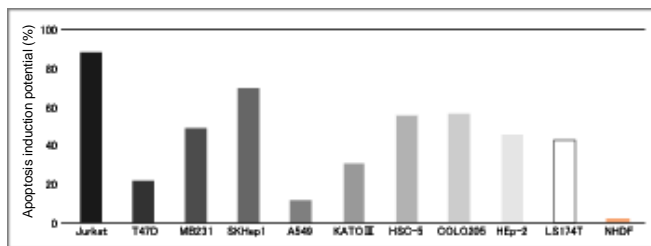
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SOLWEED™ Experimental Data

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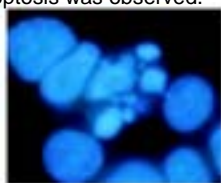
Apoptosis induction for cancer cells

SOLWEED is recognized to induce apoptosis as shown on the right graph for various cancer cells: Jurkat (leukemia T lymphoma), T47D (ER positive mammary cancer), MDA-MB231(ER negative mammary cancer), SKHep1(liver cancer), A549 (lung epithelium cancer), KATO III (stomach signet ring cell cancer), HSC-5 (skin squalors epithelium cancer), COLO205 (large bowel cancer), HEP-2 (laryngeal cancer), LS174T (rectal cancer). On the other hand, no such induction was recognized for NHDF (normal human fibroblast).



Cell shape change by apoptosis

Using Hoechst nuclear staining, the cell shape change through apoptosis was observed.



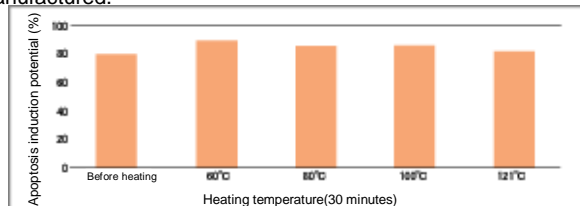
Cells on which apoptosis occurred.



Cells on which apoptosis did not occur.

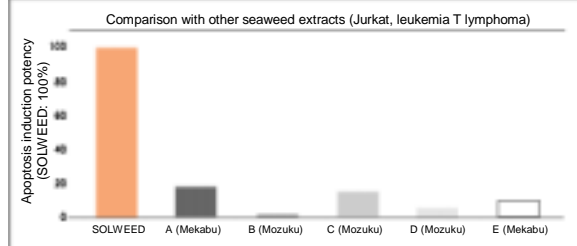
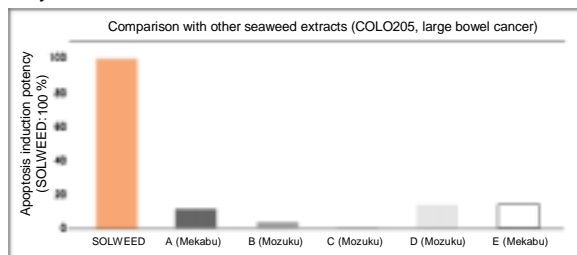
Heat stability

Assuming heat treatment during manufacturing process, the heating influence on apoptosis induction potential at the range from 60 to 121 was studied and no influence was found. This shows beverage sterilization at 80-100 can be done or retortable pouch can be manufactured.



Comparison with other seaweed extracts

Through apoptosis induction test using cells of large bowel cancer and leukemia, it was confirmed that this SOLWEED possesses higher potency than the extracts of Mekabu and Mozuku.



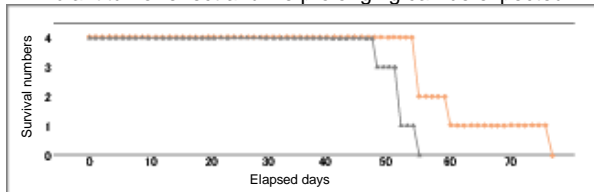
Life prolonging effect on mice

To eight BDF1 mice (seven Weeks old), FBL-3 (mouse leukemia cell) was subcutaneously injected. They were divided into two groups (each four mice). Water was fed to control group and 0.6% SOLWEED to test group.

	Test group (Fed Seaweed)	Control group (Fed no Seaweed)
Survival days after injection	60.5 +/- 9.9	50.8 +/- 2.9
Life prolonging rate	19.2 %	

The above result shows the tendency to prolong survival date after injection (transplant) by feeding SOLWEED (P-0.1).

In vivo antitumor effect and life prolonging can be expected.



H.pylori Elimination Activity

Though *Helicobacter pylori* increased in two weeks in placebo group, it decreased in both 100 mg/day and 750 mg/day SOLWEED ingestion groups.

It is shown that this effect is dose-dependent, which indicates that the elimination/reduction activity of *H.pylori* is derived from SOLWEED.

