Nematode controlling effects of rare sugars and tea polyphenols

(Keywords: D-Psicose, Tea polyphenol, Anthelmintic drug)

Outline of technology

In the tropical and subtropical regions, parasitosis is still menacing people and over half the world’s population might be infected by gastrointestinal helminths. Cases of parasitosis are little found in Japan, but risk of anisakiasis, transmitted by ingesting raw fish, or imported parasitosis, or zoonotic infections is increasing. Larvae of nematodes which causes parasitosis is generally more resistant to host factors than adults. Therefore, control of larvae is more difficult than that of adults.

Of all ketohexose stereoisomers (eight possible species, i.e., D- and L-forms of psicose, tagatose, fructose and sorbose), only D-psicose markedly inhibited growth and sexual maturation of L1 stage Caenorhabditis elegans. In addition, tea polyphenols were found to have strong nematode controlling effects. This effects were high when tea polyphenol compounds and D-psicose were used in combinations compared with the case of a use of polyphenol alone. In view of the observed survival rates of C. elegans, tea polyphenol/D-psicose combinations had much stronger effects than the anthelmintic drug thiabendazole in current use (Figure).

Sales points

• Contributes to the development and production of anthelmintic drugs.
• Parasitic nematodes (e.g. oxyurids) can be controlled by the use of D-psicose/tea polyphenol combinations.
• In particular, the combination is effective in controlling dog parasites. Control of the doground worm Toxocara canis is most effective in preventing human visceral larva migrans. In addition, a wide spread of human gastrointestinal nematodes is expected to be blocked by ingestion of foods and beverages containing D-psicose and tea polyphenols, especially, in the tropical and subtropical regions.

Expected application fields and products

(1) Human anthelmintic drugs
(2) Anthelmintic drugs for domestic animals including dogs and cats
(3) Food additives or healthy foods/beverages
(4) Pet or domestic animal foods

Comparison of D-psicose/tea polyphenol combinations with the anthelmintic thiabendazole in current use

<table>
<thead>
<tr>
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<th>Anthelmintic effect</th>
<th>Indications</th>
<th>Adverse effects</th>
<th>Possibility of the appearance of resistant species</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>D-psicose/tea polyphenol combinations</td>
<td>High</td>
<td>Wide</td>
<td>None</td>
<td>Low</td>
<td>in effective for larva migrans</td>
</tr>
<tr>
<td>Thiabendazole</td>
<td>Low</td>
<td>Wide</td>
<td>High</td>
<td>High</td>
<td>Low effect</td>
</tr>
</tbody>
</table>

References, patents, etc.

• Related industrial property rights: PCT/JP2007/054082

• Related literature:

Other matters to note

(Developer’s comment)

People in the tropical and subtropical regions (about half the world’s population) are suffering from parasite infections, most of which are nematode infections. However, not much attention has been directed to parasitoses compared with lifestyle-related diseases prevalent in developed countries. We hope that Kagawa University can make contribution to people of the world suffering from parasite infections.

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Bright-field Photomicrographs showing the results of tests on *C. elegans.*

a. D-Psicose-experienced *C. elegans*; body length, 270 μm (×100).
Freshly hatched L1 larvae (195 μm) were incubated in a standard growth medium containing D-psicose (167 mM) at 20°C for 84 h. Little growth was observed. Scale bars represent 100 μm.

b. Control animal (1132 μm) bearing eggs in the uterus (×100). L1 larvae were incubated at 20°C for 84 h in the same medium but with no D-psicose. Scale bars, 100 μm.

c. Cell disintegration in the intestine and theoocytes (×400).
Egg-bearing adults were incubated in the medium containing a tea polyphenol (250 μM) at 20°C for 60 h. Scale bars, 25 μm.

d. Control cells (×400). 1, pharyngeal lumen; 2, grinder; 3, pharyngeal-intestinal valve; 4, int1; 5, int2; 6, intestinal lumen; 7, loop region; 8, oocyte; 9, cell nucleus; and 10, coelomic cavity. Scale bars, 25 μm.