Can composting kill Japanese Knotweed

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Japanese Knotweed (*Fallopia japonica*) is a damaging invasive species that is widespread across Britain. It causes damage to natural habitats, landscapes and also the built environment. It is commonly managed by herbicide applications or excavation and removal. In 2003, the estimated cost of eradication was £1.5 billion nationalwide (Defra, 2003). Regulatory controls on Japanese Knotweed management mean that if Japanese Knotweed is to be disposed of on-site it must be covered by a root barrier membrane layer. . When it is being disposed of to landfill it must be buried at least 5m deep or incinerated. (Environmental Agency, 2008)

A legitimate question is whether composting could offer a lower cost treatment and recycling for Japanese Knotweed materials. A related question is: what is the fate of Japanese Knotweed that is inadvertently included with green waste subsequently used for composting? Japanese Knotweed can propagate from very small fragments of rhizome (circa 1 gram) and larger pieces regenerate quickly (see photograph 1). Given this capacity for regrowth, regulators are likely to require a strong basis of evidence to allow composting to accept and recycle Japanese Knotweed.

A recent project at the University of Reading provides initial evidence that compost treatment of Japanese Knotweed is indeed a viable treatment and recycling route. This project evaluated the minimum temperature regime that kills Japanese Knotweed and whether this regime could be achieved by commercial composting processes. Disposal via composting would be a much cheaper disposal route compared with landfill at depth and incineration. Ward (2003) reported on the viability of Japanese Knotweed rhizomes through composting based on their ability to regrow. A complicating factor is that Japanese Knotweed rhizome can show periods of dormancy, and therefore the time for allowing regrowth is a little uncertain. An alternative approach for looking at root viability is to use a "vital dye" which stains only living cells. Our project used the 2,3,5 triphenyl tetrazolium chloride (TTC) which is reduced in living cells by dehydrogenase enzymes (see photograph 2) . The method is complicated because the dye also reacts with polyphenols in lignified roots, and therefore can only be used in new growth from Japanese Knotweed. However, the tissue types in these young roots are representative of root systems and the plant more generally, so it is a suitable "model" for the whole plant.

Rhizome fragments, 20 mm in length, were incubated in compost or soil with wet and dry moisture contents at different temperatures over a range of times. The results of this test-work soon showed that temperatures in excess of 50℃ killed rhizome. Indeed, lower temperatures also inactivated rhizome (see Table). However, the responses of the rhizomes to the lower temperature are different between soil and compost mixture. The rhizomes in the soil with lower moisture content (6%) were totally killed at 45℃ after 24 hours while majority of those in the compost (61%) survived after the same treatment. In short, the results of heating treatments showed that rhizome segments were more likely to survive in the high moisture content composts through this heating process rather than in soil or drier compost, but for both materials and both moisture contents rhizomes were inactivated by 45℃ after 48 hours or 40℃ after 72 hours (see Table). These findings suggest that Japanese knotweed is readily susceptible to typical compost process temperatures which supports the case for recycling Japanese Knotweed biomass by commercial composting systems.

The next step for this work will be to carry out some repeat tests using a broader range of composts and soils; and then to look at burial and retrieval testing in commercial composting plants. We would be

delighted to hear from *Organics Recycling* readers who would like to assist with this and support what could be a useful commercial opportunity for the industry.

Contact Paul Bardos and Steve Robinson for more information

References

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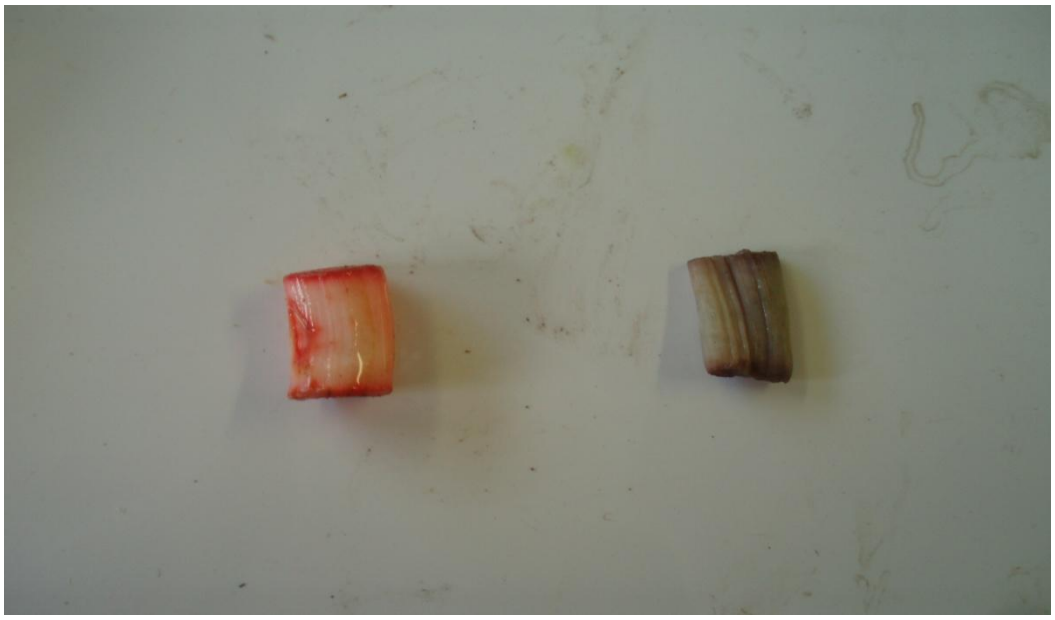
Photograph 1: the regeneration of the Japanese knotweed rhizome



Photograph 2: red stained viable rhizome segment and unstained dead fragment.

Table: The effects of 0 to 72 hours' heating treatment on the viability of 3 duplicates of rhizome segments under different temperature regimes (R: get red stained. N: not stained.)

Temp °C	25°C		40°C		45°C		50°C	
Duration	Loam	Compost	Loam	Compost	Loam	Compost	Loam	Compost
0 hour	R R R	R R R	R R R	R R R	R R R	R R R	R R R	R R R
4 hours	R R R	R R R	R R R	R R R	R R R	R R R	N N N	N N N
8 hours	R R R	R R R	R R R	R R R	R R R	R R R	N N N	N N N
24 hours	R R R	R R R	R R R	R R R	N N N	N R R	N N N	N N N
48 hours	R R R	R R R	R R R	R R N	N N N	N N N	N N N	N N N
72 hours	R R R	R R R	N N N	N N N	N N N	N N N	N N N	N N N