Disentangling Japanese Knotweed

Poster · November 2016
DOI: 10.13140/RG.2.2.31093.99048

1 author:

Daniel Llewelyn Jones
Swansea University
6 PUBLICATIONS **31** CITATIONS

SEE PROFILE

Disentangling Japanese Knotweed

Daniel Jones[1,2], Gareth Bruce[1,2], Mike Fowler[1], Rhyan Law-Cooper[1,2], Ian Graham[3], Alan Abel[3], F. Alayne Street-Perrott[4] & Daniel Eastwood[1]

[1]Department of Biosciences, Swansea University, UK; [2]Advanced Invasives Ltd., Institute of Life Science, Swansea University, UK;
[3]Complete Weed Control Ltd., Newton Aycliffe, UK; [4]Department of Geography, Swansea University, UK

Overview

Japanese knotweed (*Fallopia japonica* var. *japonica*) has well documented ecological and socioeconomic impacts that are costly to remedy.

Ecological impacts:
- Reduced habitat availability and quality
- Disruption of terrestrial and freshwater food webs[1]

Socioeconomic impacts:
- Built environment (e.g. development sites)
- Recreation and landscape (e.g. angling)
- Maintenance control costs for knotweed in the UK are £165.6 million per annum and eradication would cost in excess of £1.5 billion[2,3]

How are we testing control response?

Trialling 24 proven and novel knotweed physiochemical control methods at three sites in South Wales (Figure 1).

Field trial plots consist of:
- 225 m^2 treatment area (15×15 m)
- 6×4 m^2 monitoring patches, assigned at random
- Treatment plots are replicated in triplicate and treated in their entirety
- Control plots received no treatment

Monitoring patch data capture:
- Aboveground knotweed growth parameters (e.g. stem diameter)
- Plant stress measures (e.g. photosystem II efficiency)
- Vascular plant species diversity
- Soil parameters

This represents the largest knotweed control experiment ever undertaken and includes the greatest number of treatments ever trialled for the control of a single invasive species (the previous best is 6!). Further, it is one of the longest running invasive species field trials, worldwide[4].

Results

- First 3 years of results are now in publication
- It is clear that there are no short-term solutions for controlling knotweed
- Physical methods are ineffective due to significant rhizome energetic reserves and also encourage spread (Figure 2A)
- Most herbicides are formulated and tested on annual plant species (e.g. synthetic auxins), with significant implications for control of deep-rooted, rhizome-forming species such as knotweed (Figure 2B)
- Rhizome exhibits strong seasonal changes in herbicide uptake - crucial for optimising control treatment performance (Figures 2C & D)

Wider application

- Our approach and results are not only relevant for the control of invasive plants that are resilient to control treatments, but also problematic agricultural weed species with extensive rhizomes such as Field bindweed (*Convolvulus arvensis*) and deep root systems such as Docks (*Rumex* spp.) and Creeping thistle (*Cirsium arvense*)[5,6]
- Further, control based on plant life history traits and physiology also holds promise for control of annual invasive plants and weeds in agricultural systems

Field trial rationale

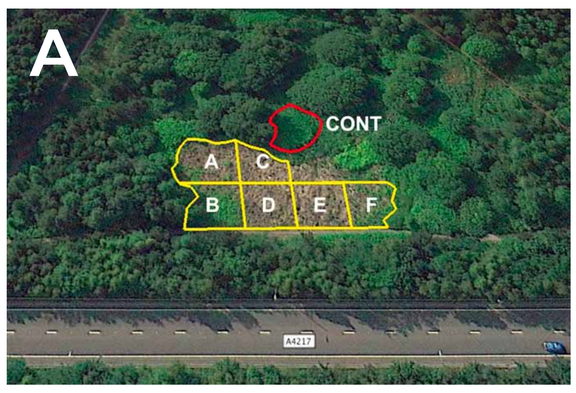
Knotweed is an internationally recognised problem. However, previous control research has been small-scale, piecemeal and crucially, of short duration. Due to limited understanding of plant-herbicide interactions and long-term control outcomes, practitioners and stakeholders were not able to make good, evidence-based decisions on how to control these species effectively, efficiently and sustainably.

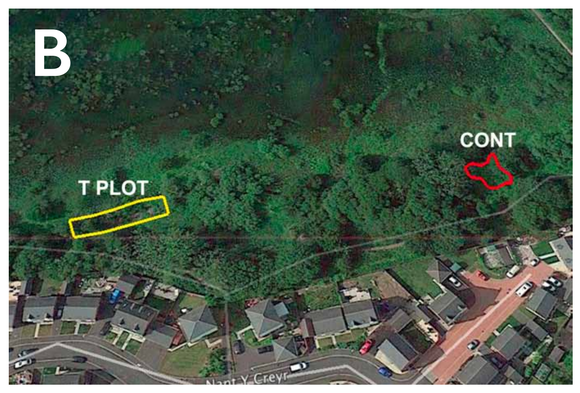
Our ability to control knotweed relies on how well we understand the plant, herbicides and physical treatments that we use to control it. Additionally, with no long-term studies of knotweed control, it was not possible to adequately predict control response in the long-term.

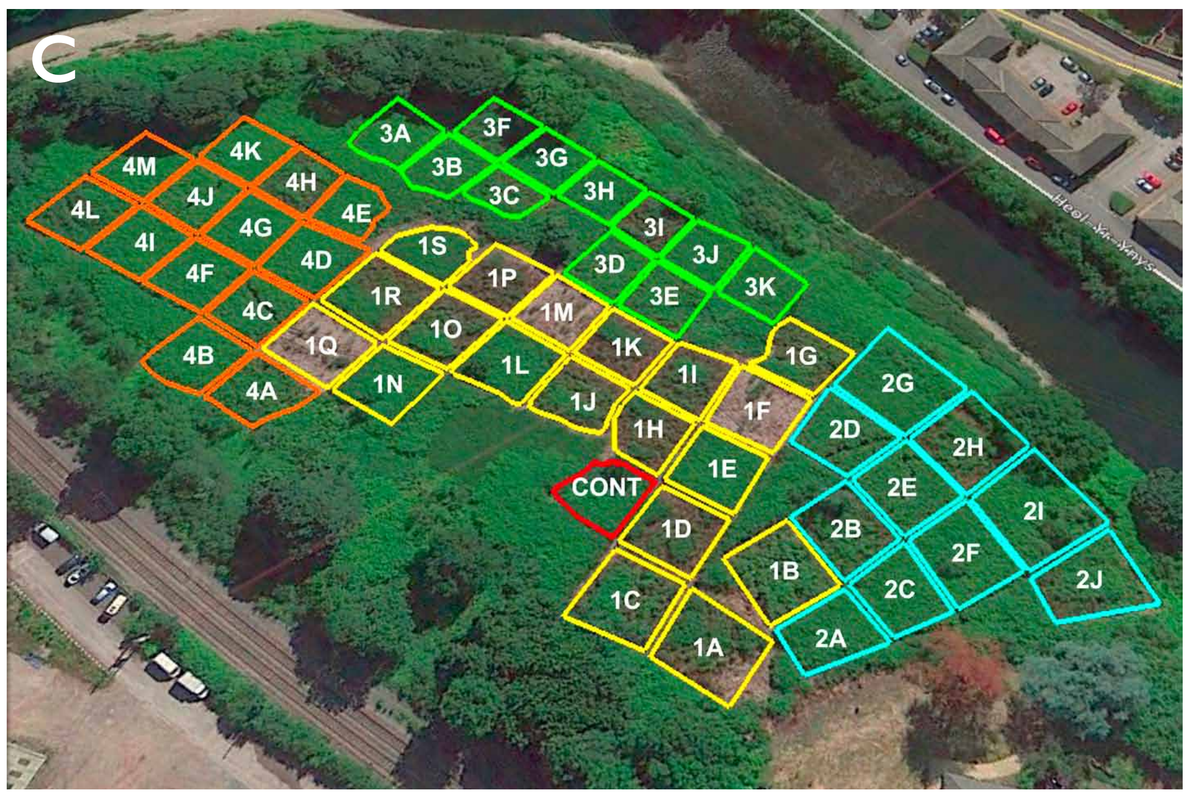
Aims

Based on our new understanding of knotweed biology, we established a large-scale and long-term field experiment to:
- Test control efficacy of widely applied and novel control methods
- Assess control method costs and environmental impacts
- Investigate site restoration following knotweed control

Figure 1: Aerial views of field trial sites in South Wales. Where A = Lower Swansea Valley Woods; B = Swansea Vale Nature Reserve and C = Taffs Well (nr. Cardiff)





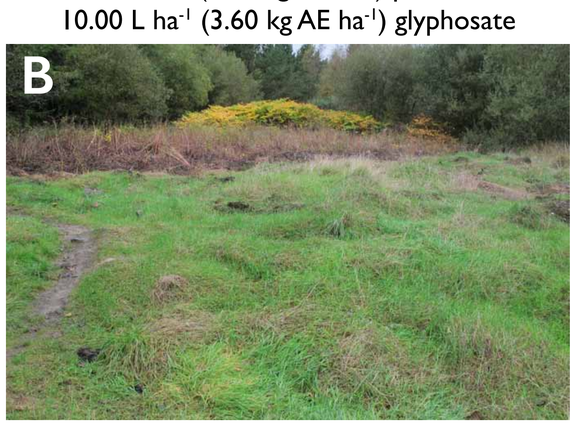


References:
[1] Gerber et al. 2008; [2] Shaw et al. 2009; [3] Williams et al. 2010; [4] Kettenring & Adams 2011; [5] Hujerová et al 2013; [6] Tautges et al. 2016.

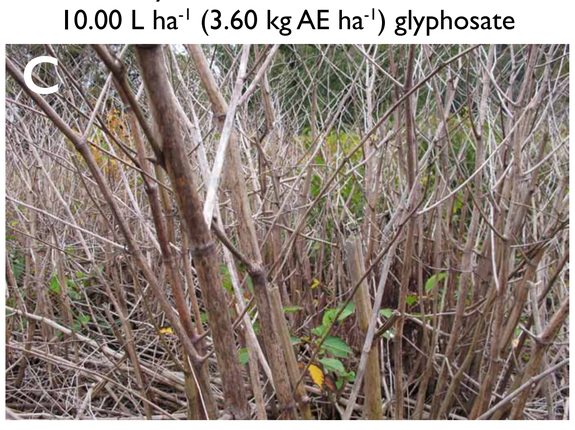
Figure 2: Control treatment observations.

Covering treatment
888 DAT

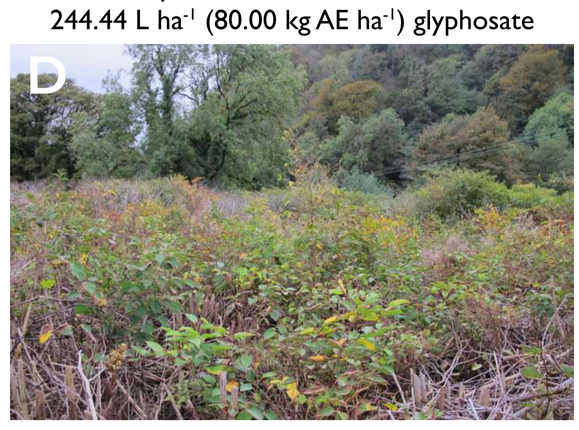
Tordon 22K® & Glyfos ProActive® 797 DAT
11.20 L ha^{-1} (2.69 kg AE ha^{-1}) picloram &
10.00 L ha^{-1} (3.60 kg AE ha^{-1}) glyphosate



Single spray treatment
Glyfos ProActive® 404 DAT
10.00 L ha^{-1} (3.60 kg AE ha^{-1}) glyphosate



Cut & fill treatment
Glyfos ProActive® 407 DAT
244.44 L ha^{-1} (80.00 kg AE ha^{-1}) glyphosate



Acknowledgements:
- Dr Tim Rich and Dr John Bailey for advice and support
- Mr Gethin Bowes, Dr Jonathan Newman, Dr Andrew Skibo, Mr Art Gover, Dr Charles Hipkin, Dr Lois Child, Dr David Stock and Mr Barrie Hunt for their extensive practical and technical advice and for equipment provision
- Prof Bruce Osborne for discussions and guidance
- Mr Sean Hathway for supplying sites
- Mr Dan Montagnani for supplying detailed site reports

ADVANCED INVASIVES
Applied Science. Superior Results.

Dr Dan Jones contact information:
Email - daniel@advancedinvasives.com | Mobile - +44 (0)7967 408844

Part-funded by the European Social Fund (ESF) through the Welsh Government with Swansea University and Complete Weed Control Ltd.

complete weed control
Swansea University Prifysgol Abertawe
Llywodraeth Cymru Welsh Government
ESF Llywodraeth Cymru Welsh Government
Ewrop & Chymru Buddsoddi yn eich dyfodol
Europe & Wales: investing in your future
European Social Fund