The genomes of several plant species contain endogenous geminiviral sequences

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Endogenous viral sequences are essentially ‘fossil records’ that can sometimes reveal the genomic features of long extinct virus species. Although numerous known instances exist of single-stranded DNA (ssDNA) genomes becoming stably integrated within the genomes of bacteria and animals, there remain very few examples of such integration events in plants. The best studied of these events are those which yielded the geminivirus-related DNA elements (GRD) and the geminivirus-like elements (EGV) found respectively within the nuclear genomes of several Nicotiana species (Kenton et al. 1995; Bejarano et al. 1996; Ashby et al. 1997; Murad et al. 2004) and various Dioscorea spp. of the Enantiothyphylaceae clade (Filloux et al., 2015).

The genomes of many yam (Dioscorea spp.) species contain transcriptionally active endogenous geminiviral sequences that may be functionally expressed

![Image of FISH on D. alata chromosomes with 2.6kb EGV1 probe (green arrows) and a rDNA 45S probe (pink arrow)]

**Characteristics of the EGV1 sequence:** partial tandem repeat, TAATATTAC, rep, ren and absence of cp

**Characteristics of the EGV2 sequence:** only rep (absence of cp, ren and rep)

**New D. alata sequence resources available to further explore yam EGVs**
- Draft genome of D. alata now available on GenBank (CZHE00000000)
- Four D. alata BAC clones containing EGVs are now sequenced (CNRGV, INRA, Toulouse, France)

**Several other plant species contains EGVs**

We recently found using *in silico* searches that other EGVs are included within complete or draft genomes of various plant species, including apple (Malus domestica), black cottonwood (Populus trichocarpa), several Coffea spp., eggplant (*Solanum melongena*), lettuce (*lactuca sativa*), and Tepary bean (*Phaseolus acutifolius*), which suggests that endogenous geminiviruses may be more common in plant genomes than has previously been appreciated.

**Distribution of EGV1 and EGV2 sequences among members of the Dioscoreaceae family**

**Western blot on the total protein extracts of several Dioscorea species using an antibody directed to Rep peptide of EGV1**

**Maximum likelihood tree describing the evolutionary relationships between clades of Dioscoreaceae based on rbcL and matK nucleotide sequences**

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**References**


