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AAD12 amino-acid homology search for similarity to toxins

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STUDY TITLE

AAD12 Amino-Acid Homology Search for Similarity to Toxins

DATA REQUIREMENTS

None

AUTHOR(S)

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STUDY COMPLETED ON

16-May-2007

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AAD12 Amino-Acid Homology Search for Similarity to Toxins

SUMMARY

The AAD12 (aryloxyalkanoate dioxygenase 12) protein was evaluated for amino-acid sequence similarity to known toxins. A global sequence similarity search of this protein sequence against the GenBank non-redundant protein dataset was conducted in an effort to identify potential safety concerns by examining the characteristics of related proteins. The AAD12 similarity search identified 618 proteins. None of the similar proteins returned by the search identified safety concerns that might arise from the expression of AAD12 in plants.

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AAD12 Amino-Acid Homology Search for Similarity to Toxins

DATA REQUIREMENTS

None

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STUDY COMPLETED ON

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STATEMENT OF NO DATA CONFIDENTIALITY CLAIMS

Compound: AAD12

Title: AAD12 Amino-Acid Homology Search for Similarity to Toxins

No claim of confidentiality is made for any information contained in this study on the basis of its falling within the scope of FIFRA Section 10 (d)(1)(A)(B), or (C).*

Company: Dow AgroSciences LLC

Company Agent: P. L. Hunst

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Signature: *Penny L. Hunst*

Date: 4/27/2007

*In the United States, the above statement supersedes all other statements of confidentiality that may occur elsewhere in this report.

THIS DATA MAY BE CONSIDERED CONFIDENTIAL IN COUNTRIES OUTSIDE THE UNITED STATES.

STATEMENT OF COMPLIANCE WITH GOOD LABORATORY PRACTICE STANDARDS

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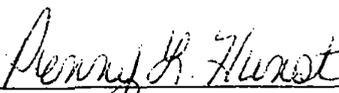
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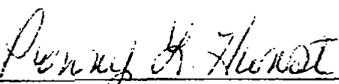
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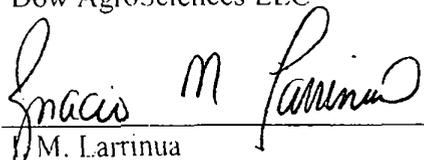
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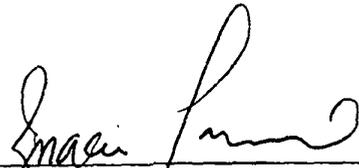
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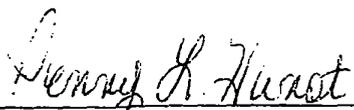
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AAD12 Amino-Acid Homology Search for Similarity to Toxins

ABSTRACT

The AAD12 (aryloxyalkanoate dioxygenase 12) protein was evaluated for amino-acid sequence similarity to known toxins. A global sequence similarity search of this protein sequence against the GenBank non-redundant protein dataset was conducted in an effort to identify potential safety concerns by examining the characteristics of related proteins. The AAD12 similarity search identified 618 proteins. None of the similar proteins returned by the search identified safety concerns that might arise from the expression of AAD12 in plants.

INTRODUCTION

The AAD12 (aryloxyalkanoate dioxygenase 12) protein was evaluated for amino-acid sequence similarity to known toxins. A global sequence similarity search of this protein sequence (Figure 1) against the GenBank non redundant protein dataset was conducted in an effort to identify potential safety concerns by examining the characteristics of related proteins. This data base was posted on February 17th, 2007 and had 4,626,804 sequences with 1,596,079,149 amino acids.

METHODS AND MATERIALS

The similarity search was conducted using the BLASTP 2.2.10 algorithm (1) with a cutoff expectation (E) value of 1.0. AAD12 is an enzyme and preliminary blast results indicated that there would be more than 500 significant hits which is the limit of the web based blast interface. Therefore blastp was run on the command line using the following set of parameters –
`/usr/local/blast-2.2.10/bin/blastall -p blastp -d /usr/local/blast-2.2.10/db/blastlibs/nr -i /genomics/AAD12.txt -o /genomics/AAD12results02222007.txt -e 1 -v 5000 -b 5000 -F ""`.
Accession numbers were extracted from the description line of the BLAST result and used to download the GenPept file for each accession using batch Entrez (<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=protein&cmd=search&term=>). Only one kind of error was reported by Batch Entrez. There were three records from the Structure database rather than the Protein database. These could be accessed from the Structure database and the proper GenPept file downloaded.

A perl script RegParse2.pl (Figure 2) was written which parsed the Genpept file and extracted, as tab delimited records, the locus the protein product and the region_name(s). There is only one possible protein product but many possible region_names. If there was no protein product, the script inserted a tab. The script does not handle multiline names, so these were completed manually. The tab delimited file could be imported into Excel and manipulated to sort proteins with similar protein products or region_names together.

RESULTS AND DISCUSSION

The AAD12 similarity search identified 618 proteins. These proteins were annotated with an enzyme function, because the GenPept page for this protein contained a well characterized enzyme activity in its Features annotation under product or region_name. These proteins can be broken down into a few major subclasses. The largest subclass, containing 474 proteins, was identified as tauD or taurine dioxygenases. These are proteins involved in the degradation of taurine. (2). The next largest class, with 138 members, was clavaminic acid synthetases or "CAS-like"(3). There were 2 tolC proteins (XX) which are known efflux pumps (4). The last four proteins were: 1) a (S)-2-(2,4-dichlorophenoxy)propionate, 2-oxoglutarate dioxygenase (5); 2) a pvcB protein which is a known CAS like protein (see accession page of NP_968348); 3) a inosine-uridine preferring nucleoside hydrolase (6); and 4) a hypothetical protein with no functional annotation. Inspection of the BLink results accessible from the GenPept page of this protein reveals significant homology (9e-150) to both CAS and tauD. None of these protein classes are known toxins.

CONCLUSIONS

None of the similar proteins returned by the search identify safety concerns that might arise from the expression of AAD12 in plants.

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FIGURE 1. AMINO ACID SEQUENCE OF AAD12

MAQTTLQITPTGATLGATVTGVHLATLDDAGFAALHAAWLQHALLIFPGQHLSNDQQITFAKRF
GAIERIGGGDIVAISNVKADGTVRQHS PAEWDDMMKVIVGNMAWHADSTYMPVMAQGAVFSAEV
VPAVGGRTCFADMRAAYDALDEATRALVHQRSARHSLVYSQSKLGHVQQAGSAYIGYGMTTAT
PLRPLVKVHPETGRPSLLIGRHAHAIPGMDAAESERFLEGLVDWACQAPRVHAHQWAAGDVVVW
DNRCLLHRAEPWDFKLPVMMWHSRLAGRPETEGAALV

FIGURE 2. PERL SCRIPT

```
#!/usr/bin/perl -w
#written by Ignacio Larrinua
#Feb 28th, 2007
#extract LOCUS and region_name from GenPept files

$file1 = $ARGV[0];
open (INFILE, "<$file1") or die "Can't open that file";

$file2 = $ARGV[1];
open (OUTFILE, ">$file2") or die "Can't open that file"; #10

while (<INFILE>) {
    $productnumber = 0;
    if (/^LOCUS/) {
        @locus = split (/\\s+/, $_);
        chomp $locus[1];
        $productnumber++}
    elsif (/^\\s+\\/product/) {
        @product = split ("=", $_);
        chop $product[1];} #20
    elsif (/^\\s+\\/region_name/) {
        @name = split ("=", $_); #20
        chomp $name[1];
        push @region, $name[1];
        undef @name;}
    elsif ($_ eq "//\\n"){
        print OUTFILE "$locus[1]\\t";
        $productnumber = @product;
        if ($productnumber == 0){
            print OUTFILE "\\t";} #30
        else {print OUTFILE "$product[1]\\t";}
        $regionnumber = @region;
        for ($i = -1; $i <= ($regionnumber-2); $i++){
            print OUTFILE "$region[$i]";}
        print OUTFILE "\\n";
        undef @locus;
    }
}
```

```
        undef @product;  
        undef @region;}  
    else {next;}  
}
```

```
close INFILE;  
close OUTFILE;
```