

# The application of XML in the Denotation of Plant Diseases and Insect Pests Information

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**Abstract:** *This paper describes the design process of Plant Diseases and Insect Pests Information Markup Language that is used in Plant Diseases and Insect Pests Information Database of Installation Agriculture Information Platform. After analyzing and defining the basic comprising elements of plant diseases and insect pests information, the XML Schema of Plant Diseases and Insect Pests Information Markup Language is constructed. It puts forward a criterion for describing plant diseases and insect pests information.*

**Keywords:** *XML, Plant Diseases and Insect Pests Information, Schema, Installation Agriculture Information Platform*

## 1 Introduction

Installation Agriculture Informational Platform depends on computer technology and Internet. It can promptly, accurately collect, reorganize, process and transmit domestic and foreign Installation Agriculture information to achieve Installation Agriculture information sharing. It provides necessary condition for agricultural department to achieve scientific management and office automation. It also provides market guide and Installation Agriculture technique services for farmers and Installation Agriculture information system for leaders' decision making.

On the basis of sufficient investigation of all kinds of Installation Agriculture Information Platform and all kinds demands of clients, according to the requirements of system functions of field experts and computer experts, a functional framework of the Installation Agriculture Informational Platform based on Web has been determined. It includes seven functional modules, namely Client Identification module, Installation Agricultural Technique Information Query module, Plant Diseases and Insect Pests Information Query module, Information Maintenance module, System Management module, Consultancy Service module, and Fuzzy Decision Making module, as shown in figure 1.

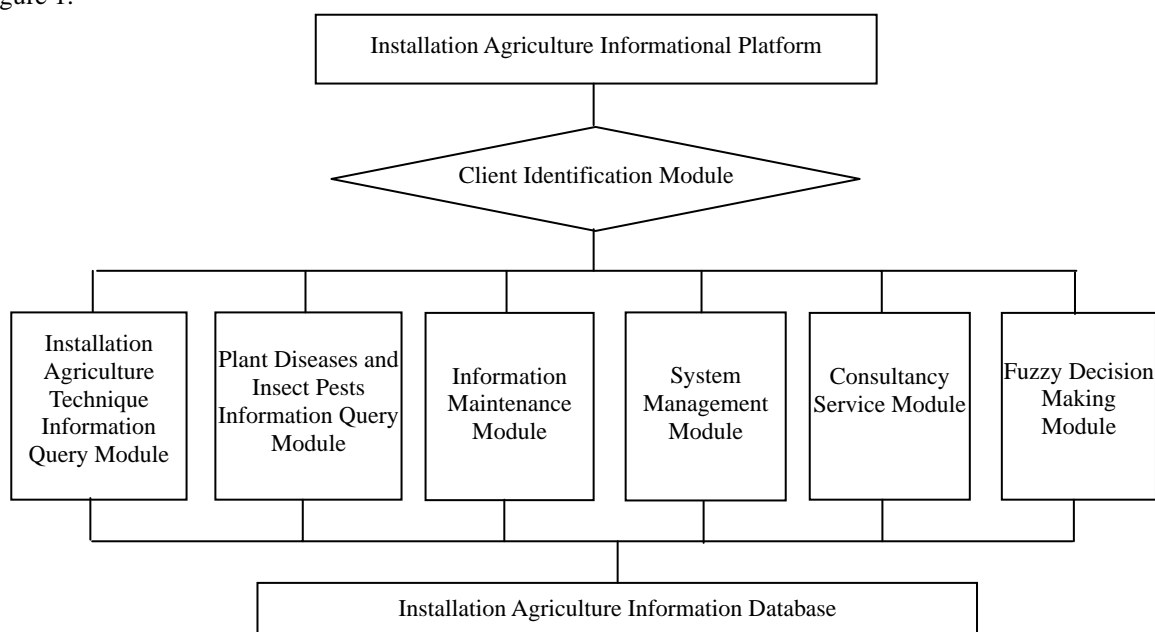


Figure 1 Functional framework of Installation Agriculture Information Platform

Installation planting benefits anniversary vegetable production and supply equilibrium. However, its planting environment is liable to cause prevalent plant diseases and insect pests that result in a lot of damage to the crops. Accordingly, the query function of plant diseases and insect pests information is constructed in the Installation Agriculture Informational Platform to effectively prevent plant diseases and insect pests for Installation Agriculture production department or individuals. After analyzing the basic elements of plant diseases and insect pests information, Plant Disease and Insect Pest Information Markup Language based on XML<sup>[1]</sup> is put forward. The Language is used to build up Plant Disease and Insect Pest Information Database<sup>[2-8]</sup> for Installation Agriculture Information Platform.

## **2 The design of Plant Diseases and Insect Pests Information Markup Language**

### **2.1 The analysis of Plant Diseases and Insect Pests Information**

Plant diseases and insect pests are natural disasters that directly affect agricultural output, quality as well as market supplies. Plant diseases and insect pests information includes two parts, namely Plant Diseases Information and Insect Pests Information.

Plant Diseases Information contains Plant Disease Name, Plant Disease Alias, Plant Diseases Popular Name, Main Damage, Region of Disease, Occurring Law, Symptom Characteristic, Preventive Method and so on. The Main Damage includes several kinds of vegetable. The Occurring Law includes Cause of disease, spreading pattern and channel and happening condition. The Preventive Method may include several methods.

Insect Pests Information contains Insect Pests Name, Insect Pests Popular Name, Main Damage, Morphological Characteristic, Life habit, Preventive Method and so on. Thereinto, the Morphological Characteristics includes Imaginal Morphology, egg Morphology, Larval Morphology and Pupal Morphology. The Preventive Method may include several methods.

### **2.2 The establishment of the family tree of Plant Diseases and Insect Pests Information Markup Language**

Based on the above-mentioned analysis, the family tree of Plant Diseases and Insect Pests Information Markup Language could be obtained, as shown in figure 2. In figure 2, any plant diseases or insect pests information is expressed clearly and roundly.

### **2.3 The design of XMLSchema for Plant Diseases and Insect Pests Information Markup Language.**

XMLSchema is a standard recommend by W3C<sup>[9-10]</sup>. Its main purpose is to define syntax and structure of XML document. It has powerful description capacity, extensibility capacity and maintenance capacity. The XMLSchema of Plant Diseases and Insect Pests Information Markup Language defines the syntax and structure of the plant diseases and insect pests information document.

The XMLSchema of Plant Diseases and Insect Pests Information Markup Language is designed according to the family tree of Plant Diseases and Insect Pests Information Markup Language. Because Plant diseases and insect pests information includes Plant Diseases Information and Insect Pests Information, and these two kinds of information are very different in constitute elements, two files *plant.xsd* and *pest.xsd* are compiled to define the syntax and structure of Plant Diseases Information document and Insect Pests Information document respectively.

*Plant* is defined as the root element of Plant Diseases Information that contains several child elements *Plant Diseases Information*. The element *Plant Diseases Information* includes eight elements, namely Id, Plant Disease Name, Plant Disease Alias, Plant Diseases Popular Name, Main Damage, Region of Disease, Occurring Law, Symptom Characteristic and Preventive Method.

Thereinto, element Plant Disease Alias at least includes an element Alias; element Main Damage at least includes an element Vegetable Name; element Region of Disease includes element Cause of Disease, element Spreading Pattern and Channel and element Happening Condition; element Preventive Method at least includes an element Method.

Thereby, the pattern file *plant.xsd* can be formed as follows.

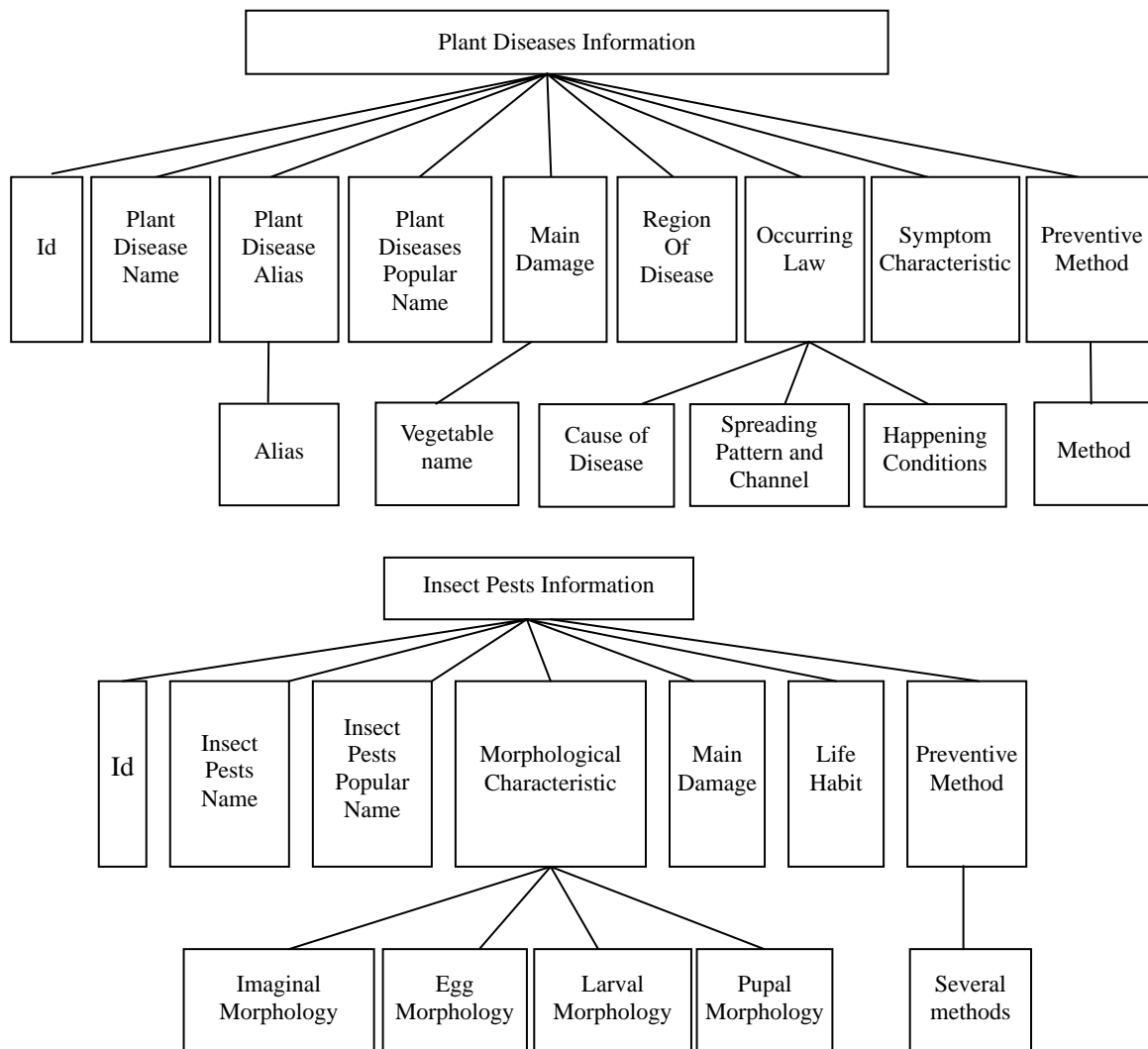


Fig.2 The family tree of Plant Diseases and Insect Pests Information Markup Language

```

<? Xml version="1.0"? encoding="GB2312"? >
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">
<xsd:element name="Plant">
<xsd:complexType>
<xsd:sequence>
<xsd:element name=" Plant Diseases Information" type="bhType" minOccurs="0">
</xsd:sequence>
<xsd:complexType>
<xsd:complexType name="bhType">
<xsd:sequence>
<xsd:attribute name="Id" type="xsd:IDREF" use="required"/>
<xsd:element name=" Plant Disease Name" type="xsd:string"/>
<xsd:element name=" Plant Disease Alias" type="bmType"/>
<xsd:element name=" Plant Diseases Popular Name" type="xsd:string" minOccurs="0"/>
<xsd:element name=" Main Damage" type="whType"/>
<xsd:element name=" Region of Disease" type="xsd:string"/>
<xsd:element name=" Occurring Law" type="glType"/>
<xsd:element name=" Symptom Characteristic" type="xsd:string"/>
<xsd:element name=" Preventive Method" type="ffType"/>
</xsd:sequence>
</xsd:complexType>
<xsd:complexType name="bmType">
<xsd:sequence>
<xsd:element name=" Alias" type="xsd:string" minOccurs="1" />
</xsd:sequence>
  
```

```

</xsd:complexType >
<xsd:complexType name="whType">
<xsd:sequence>
<xsd:element name="Vegetable Name" type="xsd:string" minOccurs="1" />
</xsd:sequence>
</xsd:complexType >
<xsd:complexType name="glType">
<xsd:sequence>
<xsd:element name="Cause of Disease" type="xsd:string"/>
<xsd:element name="Spreading Pattern and Channel" type="xsd:string"/>
<xsd:element name="Happening Condition" type="xsd:string"/>
</xsd:sequence>
</xsd:complexType >
<xsd:complexType name="ffType">
<xsd:sequence>
<xsd:element name="Method" type="xsd:string" minOccurs="1" />
</xsd:sequence>
</xsd:complexType>
</xsd:schema>

```

In the same way, the pattern file of Insect Pests Information, namely pest.xsd, can be compiled.

### 3 The application of Plant Diseases and Insect Pests Information Markup Language in Installation Agriculture Information Platform.

According to the family tree of plant diseases and insect pests information, one segment of plant diseases and insect pests information file pest.xsd is as follows.

```

<?xml version="1.0" encoding="gb2312" ?>
<Plant Id="pl0001">
  <Plant Disease Information>
    <Plant Disease Name> Chinese cabbage virus disease </Plant Disease Name>
    <Plant Disease Alias>
      <Alias> TuMV </Alias>
      .....
    </Plant Diseases Alias>
  < Plant Disease Popular Name>Choufeng</ Plant Disease Popular Name>
  <Main Damage>
    <Vegetable Name> Chinese cabbage </ Vegetable Name >
    .....
  </Main Damage>
  < Symptom Characteristic >.....</ Symptom Characteristic >
  <Occurring Law>
    < Cause of Disease > There are three viruses of affected Chinese cabbage,.....they are over wintering for many
    years.
    </ Cause of Disease >
  < Spreading Pattern and Channel >
    Virus by aphid and its juice.....so aphid has a close relationship to human's production action. It is an
    important medium of such disease.
  </ Spreading Pattern and Channel >
  < Happening Condition > Chinese cabbage ....., The damage is serious.
  </ Happening Condition >
  </ Occurring Law >
  < Preventive Method >
    <Method>choose the kind of disease resistance: Depending on the local situation, we should choose productive,
    disease resistance and high quality Chinese cabbage.
  </ Method >
  .....
  </ Preventive Method >
  </Plant Disease Information >
</Plant>

```

## 4 Conclusions

Plant Diseases and Insect Pests Information Markup Language is a language that is used to describe plant diseases and insect pests information. It is used in Plant Diseases and Insect Pests Information Query module of Installation Agriculture Information Platform. The establishment of the XMLSchema of Plant Diseases and Insect Pests Information Markup Language normalizes the definition of plant diseases and insect pests information document. Thus, it facilitates the spread of plant diseases and insect pests information on Internet.

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