

Structure of *Phytophthora infestans* population in north-western Algeria from 2008-2014

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INTRODUCTION

Late blight caused by *Phytophthora infestans* is the most serious disease of potato worldwide. In Algeria the disease is very common on potato, but has also been reported on tomato in some areas of the country.

During 2008-2014, the late blight has reached epidemic proportions in many potato-growing areas of the north west of Algeria, an emerging potato production region. Consequently, heavy yield losses were recorded despite the excessive use of fungicide.

In order to understand the population of pathogen in north west Algeria, a total of 161 *P. infestans* isolates collected on potato and tomato from 2008-2014 were characterized for the mating type, the level of metalaxyl sensitivity (n=92) and their genotypic diversity with microsatellite markers (n=117).

MATERIALS AND METHODS

Samples were collected during 2008-2014 from potato crops grown in the field and tomatoes grown in the field and greenhouses, located in different sites in north west Algeria (Fig. 1).

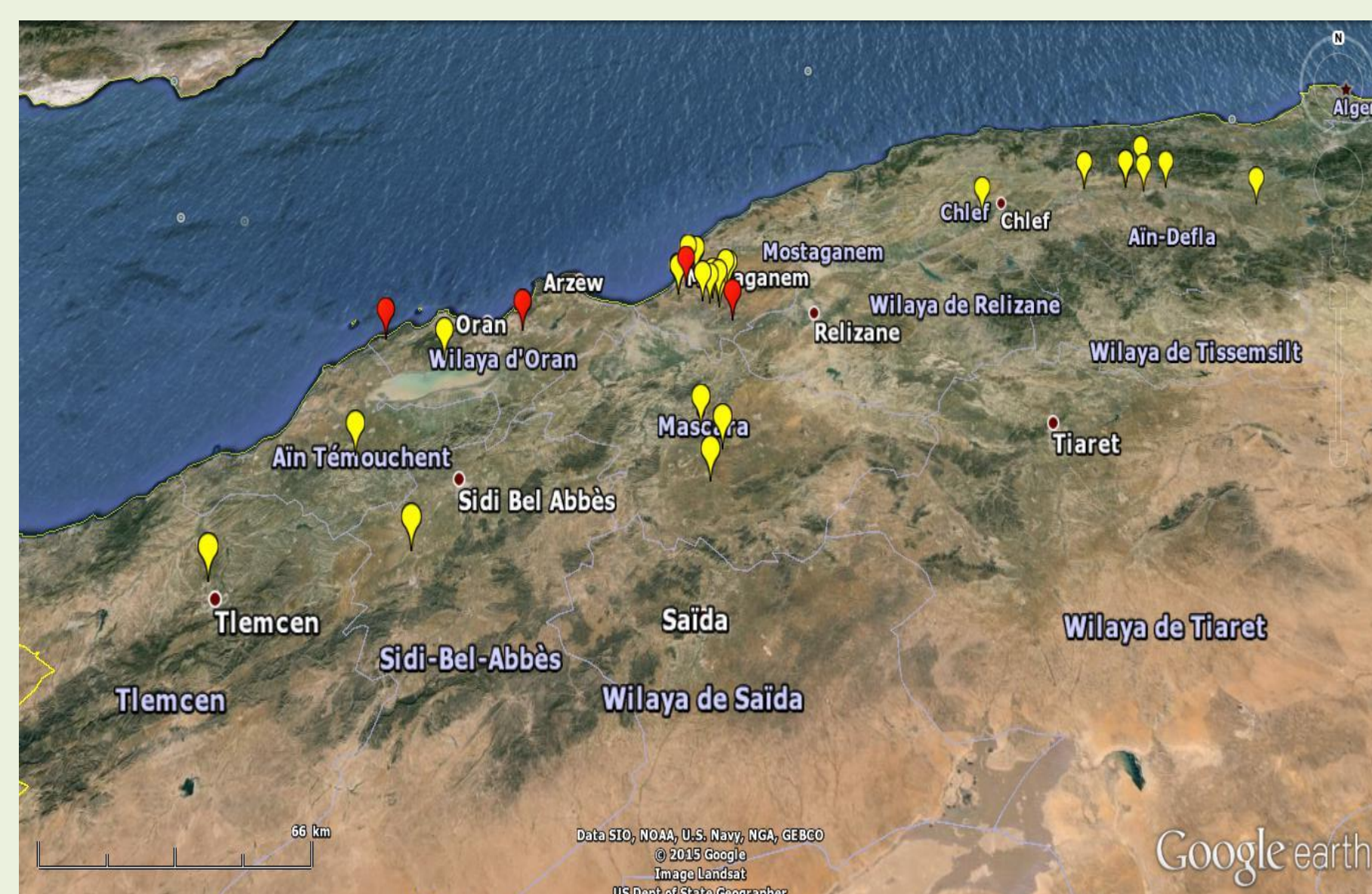


Figure 1: The Survey map indicating locations where tested isolates were taken during 2008 to 2014 in north-west Algeria

- The **mating type** of the isolates was determined by pairing them with reference isolates of A1 and A2 mating type on pea medium. After 11-15 days of incubation at 15°C, plates were examined microscopically for the presence of the oospores in the hyphal interaction area between the isolates paired.

- The **sensitivity to metalaxyl** was determined by the isolates' ability to grow and sporulate on potato leaf discs at different concentrations (0, 10, 100 mg/L). Isolates sporulating on the discs floating on water containing 100 mg/L metalaxyl were rated as resistant (R), those on 10 mg/L were rated as intermediate (I) and those that sporulated only on water were considered as sensitive (S).

- The **genotypic diversity** was analyzed using simple sequence repeats (SSR) markers: Pi02, Pi4B, G11, Pi04, Pi63, Pi70, D13, SSR2, SSR4, SSR6, SSR8 and SSR11.

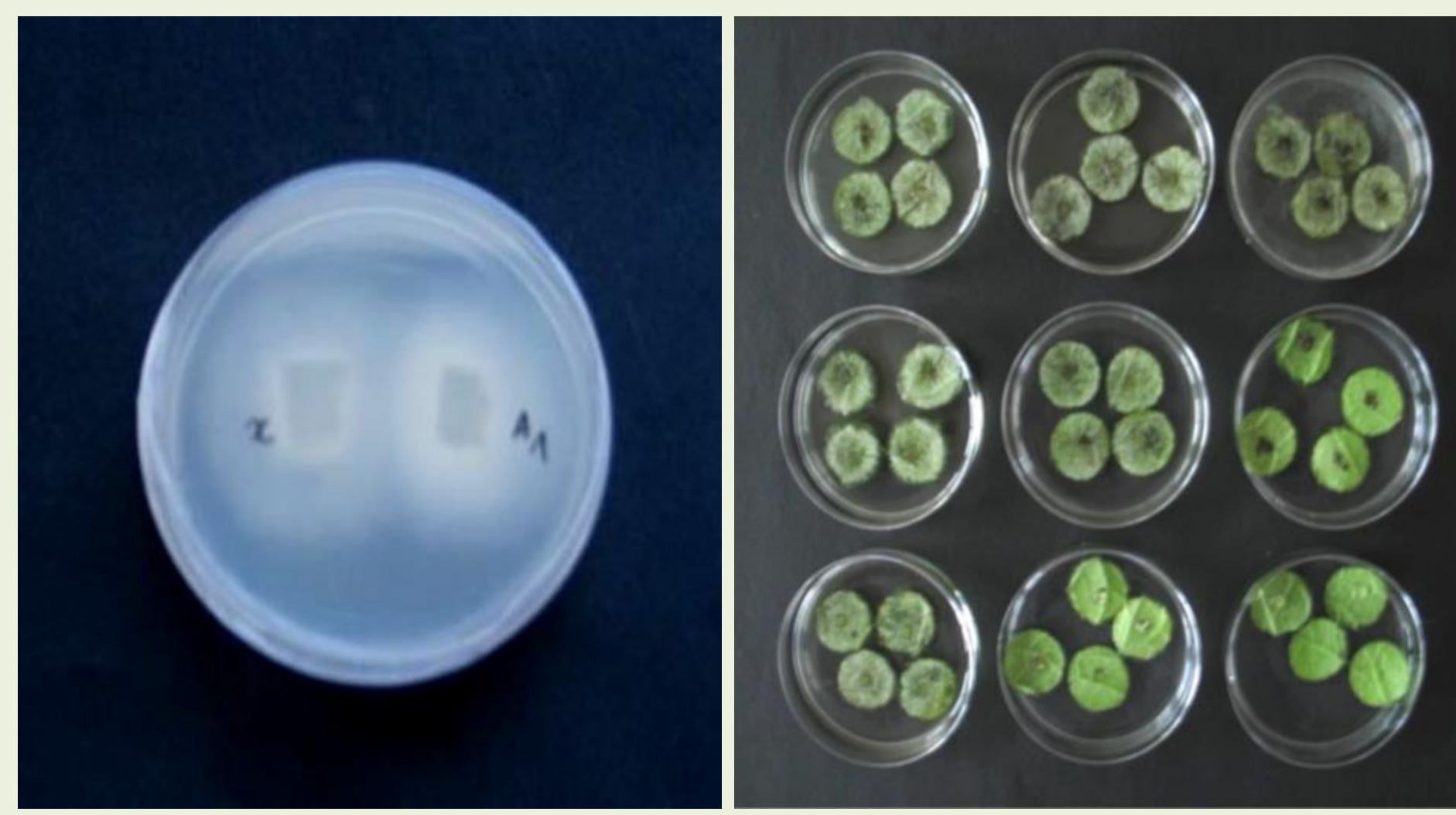


Figure 2: Mating type test **Figure 3:** Metalaxyl sensitivity test

RESULTS

- A mating type assay showed that 70 % isolates were A2 mating type and 30 % were A1 mating type. Both mating types were sometimes found in the same field.

- A high percentage of resistance to metalaxyl (89%) among isolates was detected. Metalaxyl resistant phenotype was present in both mating types with a higher percentage among A2 mating type isolates.

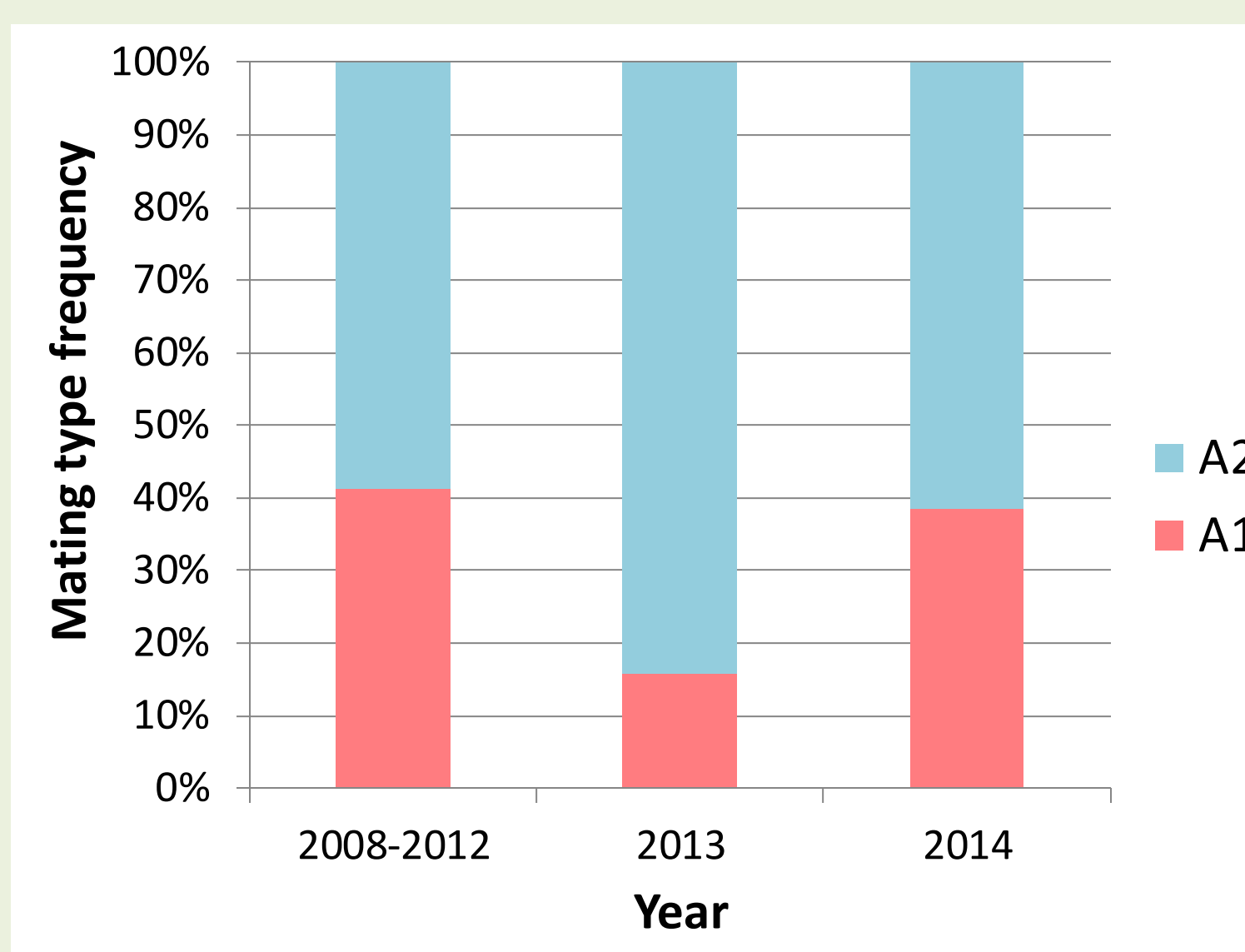


Figure 4: Frequency of mating types (A1, A2) among *Phytophthora infestans* isolates from north-western Algeria during 2008-2014

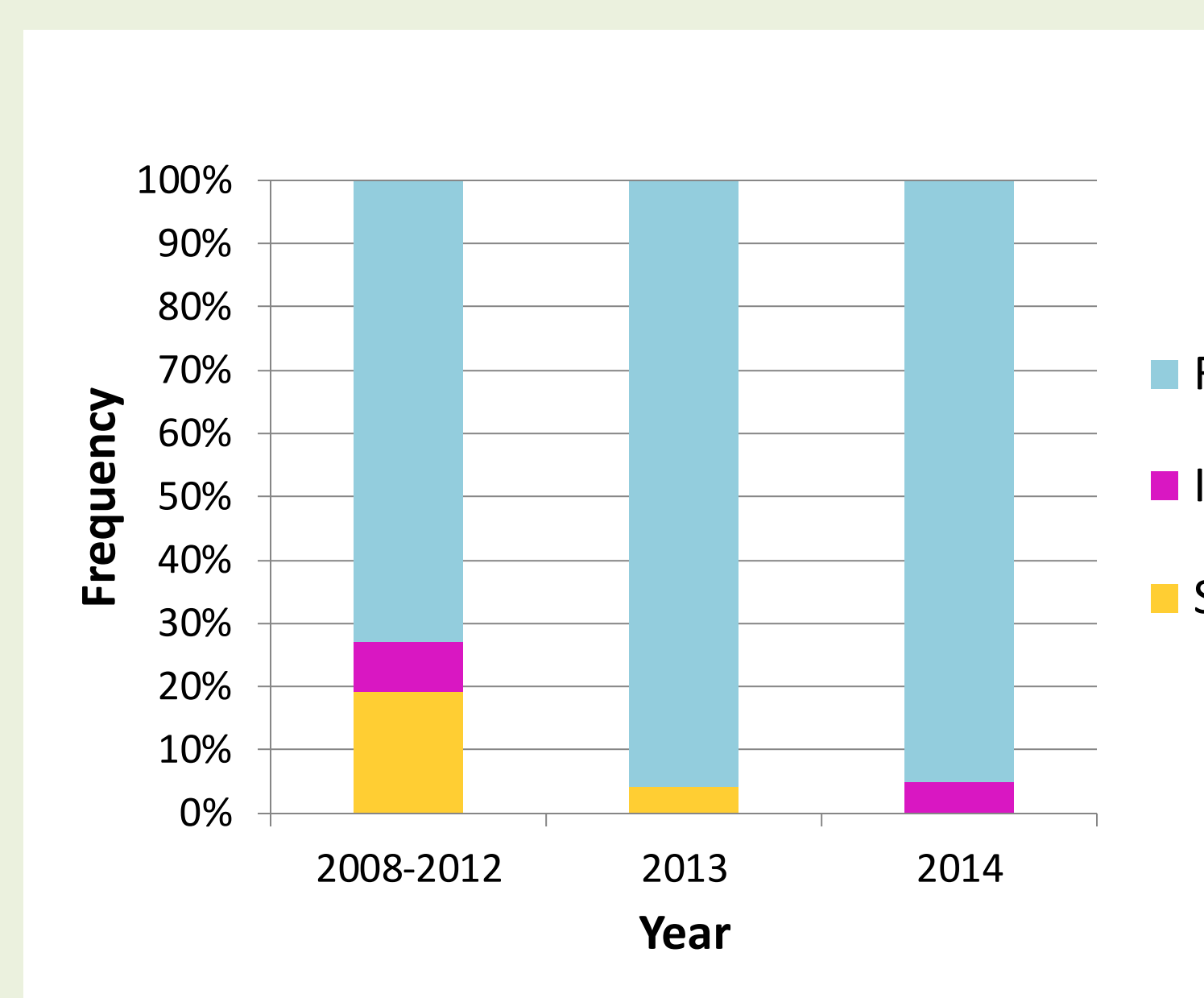


Figure 5: Metalaxyl resistance among *Phytophthora infestans* isolates from the northwestern Algeria during 2008-2014

- SSR analysis of *P. infestans* population showed a low genotypic diversity. Genotype 13_A2 was the predominant in the population with a frequency of 67% followed by 2_A1 (21%) and 23_A1 (5%). Genotype 23_A1 was detected only in tomato and potato isolates collected in 2013 and 2014.

- Several sub-clonal variants were observed in the 13_A2 population in Algeria. The 13_A2_2 subtype was most commonly recovered from 2008 to 2014.

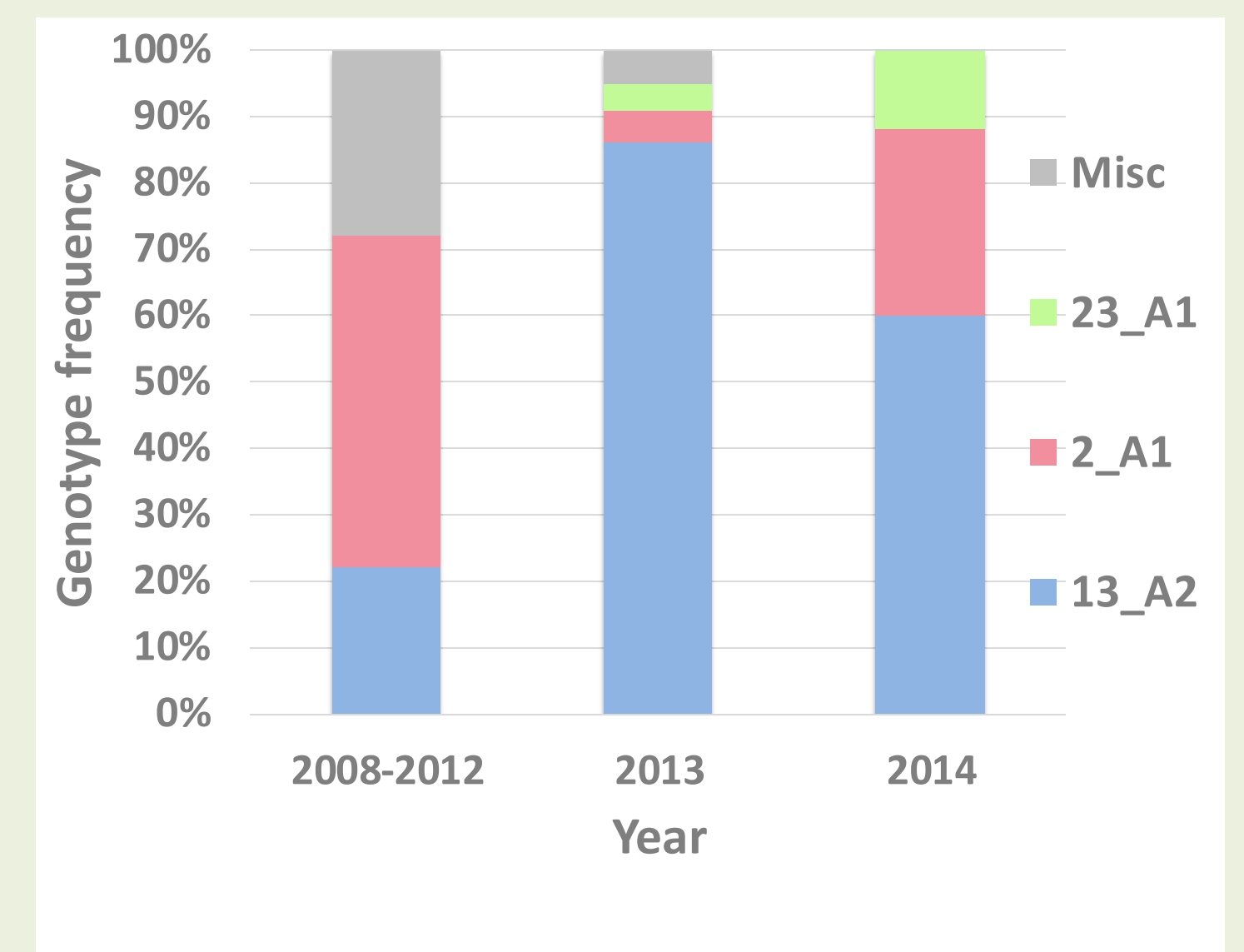


Figure 6: Genotype frequency of *Phytophthora infestans* isolates collected from north-western Algeria during 2008-2014.

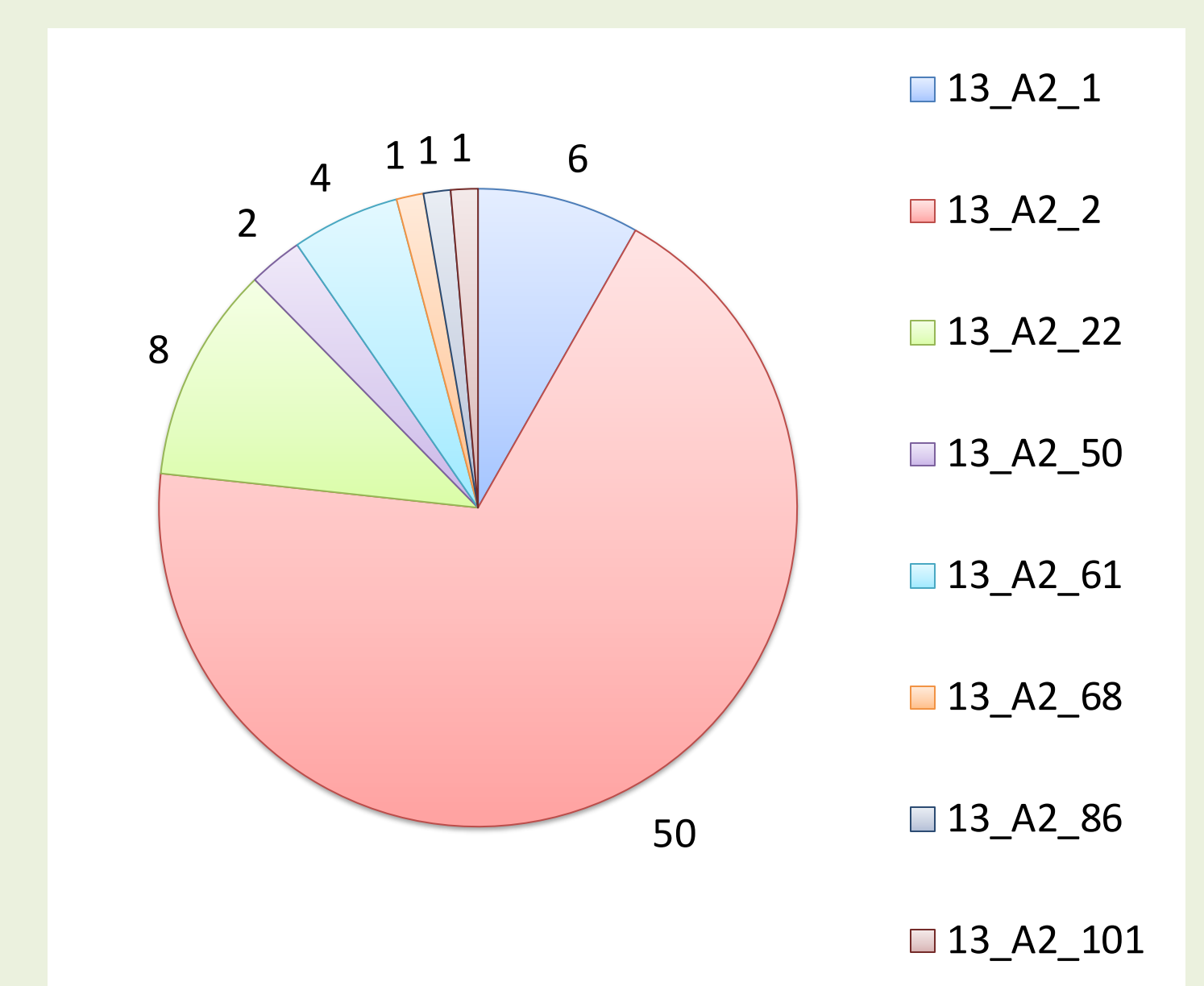


Figure 7: Sub-groups frequency analysis of the genetic 13_A2 lineage of *Phytophthora infestans* isolates collected from north-western Algeria during the period of 2008 to 2014

CONCLUSIONS

- Phytophthora infestans* population in north-western Algeria is mainly composed of the A2 mating type isolates associated with the clonal lineage 13_A2 and A1 isolates of 2_A1 and 23_A1.

- The coexistence of both mating types in most of the sampling sites means that sexual reproduction and the production of oospores may occur in this region.

- The high level of metalaxyl resistance in *P. infestans* population suggests that the use of metalaxyl formulations should be carefully planned in late blight management in Algeria.

This study is a preliminary contribution to the worldwide effort to characterize *P. infestans* and it provides some information on the pathogen population in strategic region of Algeria. Further investigations are required to establish a complete structure of the entire population of this pathogen, especially on tomato and thus complete the map of all the production areas.

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