Thrips (*Thysanoptera*) of Vegetable Crops (Okro, Spinach, Garden Egg and Pumpkin) Grown in Southeastern Nigeria

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Abstract

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Eight vegetable crops were sampled at five localities in Southeastern Nigeria and were found to harbour one or more species of thrips. The crops were *Amaranthus hybridus*, *A. spinosus*, *Basella rubra*, *Solanum incanum*, *S. melongena*, *Hibiscus esculentus*, *Telfairia occidentalis* and a species of *Solanum*. The sampled localities, with the frequency of occurrence of thrips, were Umuahia (29.6%), Owerri (28.5%), Port Harcourt (25.7%), Calabar (18.7%) and Enugu (6.0%). The studies revealed that crops with very heavy infloresences, e.g. *Amaranthus hybridus*, had a higher number of thrips (40%) per flower/leaf, while simple flowered crops like *Telfairia occidentalis* could only harbour a far lower number of thrips per flower/leaf. This showed a preference of these thrips for plants with heavy inflorescences which provided them with more protection, especially their larvae. Taxonomic/microscopic studies identified three species of thrips: *Haplothrips gowdeyi* that attacked 63% of all the sampled crops, *Frankliniella schultzei* was hosted by 50% of the crops, and *Megalurothrips ventralis* also preyed on 50% of the plant samples.

Keywords: thrips; vegetable crops; Nigeria

Thrips belong to the order *Thysanoptera* and suborder *Terebrontia* or *Tubilifera*. They are pests of vegetables with about 5000 known species (Mound & Kuo 1996). In Nigeria, four species of thrips are so far known to infest edible legumes, attacking both leaves and flowers. These species are *Megalurothrips* (*Taeniothrips*) *sjostedti* Trybom (*Thripidae*), *Frankliniella schultzei* Trybom (*Thyripidae*), *Sericothrips occipitalis* Hood (*Thripidae*) and *Haplothrips gowdeyi* Franklin (*Phleaothripidae*) (Okwakpam & Youdeowei 1980; Witney 1972). Recent surveys have shown that any one or all of the four species of thrips can be encountered on both flowers and foliages of vegetables grown anywhere in Nigeria. Most gardens and fields supported numerous species of thrips, ranging from two in tomatoes to 29 in barley, but that only one or two species were abundant enough to damage plants severely (Lewis 1973; Higgins 1992). The same plant might be attacked by different species of thrips in different parts of the globe, but only *Thrips tabaci* was found to attack onions grown between sea level and 2000m throughout the world (Lewis 1973; Chang 1991; Latimer & Oetting 1994). Sometimes, these thrips could be introduced to an area where they did not exist before through winds, animal fodder, soil, hay or another commodity (Chang 1991). Thrips feed mostly on young leaves, flowers and terminal buds but rarely on roots (Higgins 1992). However, many species are interstice dwellers, they seek protection in narrow crevices, flowers and grasses with dense inflorescences. Apart from physical damages, thrips transmit viral, bacterial and fungal diseases to various crops (Okigbo &

Ikedugwu 200). Mound and Kuo (1996) observed seven species of *Thrysanoptera* known to be vectors of tospoviruses, a serious disease of vegetables.

Thrips are serious pests in Nigeria and cause immense damage to vegetables, so that a study on thrips and their distribution on vegetable crops is very important, but only little work has so far been carried out on this aspect in Nigeria. The aim of this work was, therefore, to determine the relative abundance of thrips that infest some of the vegetable crops at the surveyed localities and conduct taxonomic studies on the different species found.

MATERIALS AND METHODS

Survey and collection. The survey and collection was restricted to some agricultural and experimental farms and gardens in the towns of Umuahia, Owerri, Port Harcourt, Enugu and Calabar, all in Southeastern Nigeria. The following eight crops were monitored and collections taken from them:

1. *Amaranthus hybridus* L. – English Spinach
2. *A. spinosus* L. – Local Spinach
3. *Basella rubra* (L.) Chev. – India Spinach
4. *Solanum incanum* L. – Local garden egg
5. *Solanum melongena* L. – Exotic type
6. *Solanum* sp. – Exotic type
7. *Hibiscus esculentus* L. – Okro
8. *Telfairia occidentalis* L. – Pumpkin.

The method of collection was simple and ensures a minimal loss of thrips. 250ml sample bottles were used, and the collection fluid was 70% alcohol and 5% glacial acetic acid in the ratio of 1:4. Enough quantity to cover the flowers/leaves was poured into the bottle, the plant parts were slowly lowered into the bottle and the cap was applied. The sample was shaken vigorously to dislodge any thrips from crevices and immobilise them.

In the laboratory, the thrips were separated from the collection fluid and flowers and leaves, aided by a magnifying lens and collecting needles. Separation of individuals was carried out under a light microscope. Analysis of variance and Duncan's multiple range were used to compare the mean occurrence of all the thrips at all the different locations and crops.

Population studies. This study was aimed at determining the relative abundance of thrips on each crop sampled. The collection was stretched over a period of three months, from the middle of April to middle of June 1995 and the sampling was done weekly. Samples were collected at random as all crops sampled were planted in beds ranging from 10 to 25 in number. At each sampling five flowers and five leaves were collected from each of the eight plant species. The frequency of

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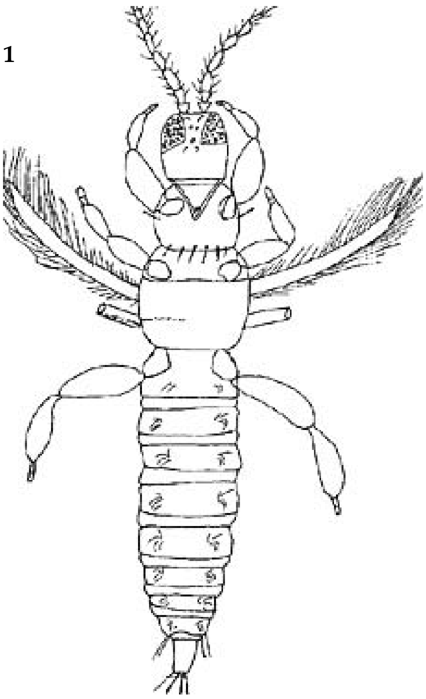

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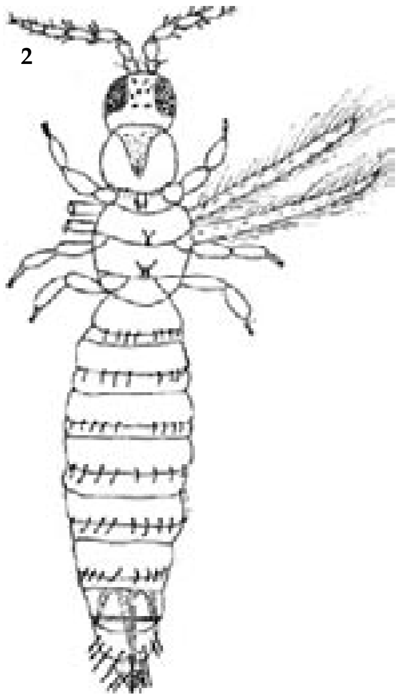

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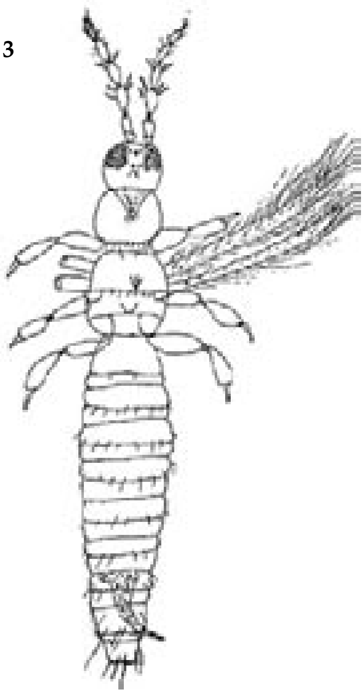

Figure 1–3. Whole mount: 1. *M. ventralis* (dorsal view); 2. *H. gowdeyi*; 3. *F. schultzei*

occurrence and relative abundance was taken as the number of thrips on the plant in an area over the total number of thrips at all localities.

The extraction and separation were similar to those used for the general survey of thrips present on the sampled vegetable crops. Therefore, the number of each different species was noted after separation. The result was taken as the overall number of thrips per flower/leaf for each of the eight crops sampled.

Taxonomic study. The study intended to complete identification of the thrips collected from the field. Each species collected from a particular crop was put into a labelled Petri dish. Boiling 5% solution of NaOH was poured into the petri dishes, these were covered and left for about 7 h. The thrips were then transferred into Petri dishes with 30% ethyl alcohol for adequate dehydration. After about 30 min each specimen was transferred to a microscope slide with two drops of Hoyers mounting medium, the insect was arranged into the required position with wings well spread out, and a cover slip applied. The specimen were examined under the microscope with attached camera and characteristic details and features were noted. Photographs of various thrips collected were taken. Identification followed a standard procedure (Okwakpam & Youdeowei 1980).

Most of the slides prepared were very clear and all taxonomically important features stood out very well. A key for the identification of the various species found on these vegetable crops was constructed.

Key to identify species of thrips found on the sampled vegetable groups:

1. Apex of abdomen conical, forewing with at least one longitudinal vein represented by setae (Figures 10–11) ... 2.
   Apex of abdomen tubular, forewings without venation (Figure 12) ... 7.

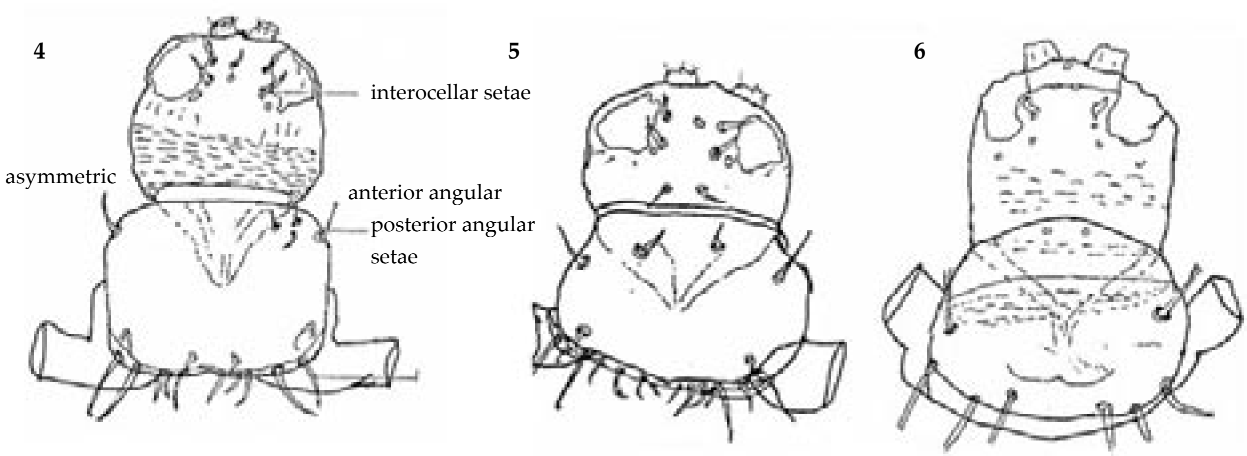

Figure 4–6. Head and prothorax (dorsal view): 4. *M. ventralis*; 5. *F. schultzei;* 6. *H. gowdeyi*

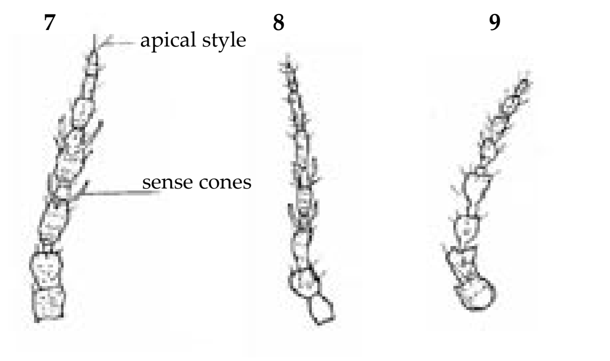

Figure 7–9. Antennae: 7. *M. ventralis*; 8. *F. schultzei; 9. H. gowdeyi*

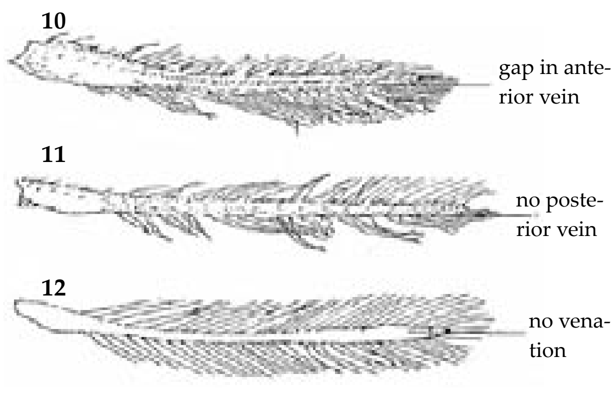

Figure 10–12. Fore wings: 10. *M. ventralis*; 11. *F. schultzei; 12. H. gowdeyi*

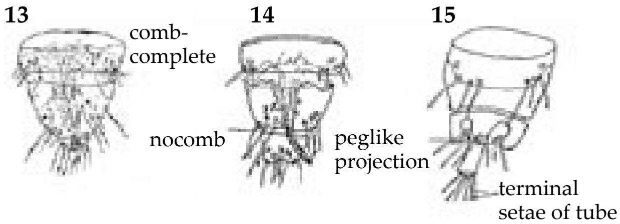

Figure 13–15. Abdominal segments viii: 13. *M. ventralis*; 14. *F. schultzei*; 15. *H. gowdeyi*

2. Antenna with eight segments, with one or two segments special style, segments iii and iv with sense cone (Figures 7–8) … 3.
3. Intercellular setae large and prominent (Figures 4–5); forewing with posterior vein (Figure 10) … 4.
4. Anterior angular setae of the pronotum half as long as the large posterior angulars; hind margin of pronotum with eight setae between the inner pair of posterior angulars (Figure 4) … 5.
   Anterior angular setae of the pronotum as long as the posterior angulars; hind margin of pronotum with 10 setae between the inner pair of posterior angulars (Figure 4) … 6.
5. Anterior vein of the forewing with a large gap (Figure 10); abdominal segment viii with complete comb (Figure 13); general body colour pale brown … *Magalurothrips ventralis*.
6. No gap in the anterior vein of forewing (Figure 11); abdominal segment viii without comb (Figure 14); general body colour pale yellow or brownish yellow; head and prothorax paler than the rest of the body; eyes very dark … *Frankliniella schultzei*.
7. Fore-and hindwings constricted at the middle (Figure 12); terminal setae of abdominal tube not much longer than the tube, abdominal segment vii with peg-like projections and no comb (Figure 15); general body colour darkish brown; anterior part of the antenna lighter than the posterior part … *Haplothrips gowdeyi*.

RESULTS

The results showed that all sampled crops were infested with one or more species of thrips (Tables 1–3). Altogether three species of thrips were identified (Figures 1–3).

The sampled crops vary in their susceptibility to different species of thrips. The two *Amaranthus* spp. could host one species of thrips only (*Haplothrips gowdeyi*, 39.9 and 25.7%) and likewise only one species was found on *Solanum incanum* (Table 1). *Basella rubra*, in addition to *H. gowdeyi* (3.1%), was host to *Megalurothrips ventralis* (12.3%). *Telfairia occidentalis* was susceptible to both *H. gowdeyi* (2.8%) and *M. ventralis* (8.3%). *Solanum melongena* and *Solanum* sp. individually harboured both *Frankliniella schultzei* and *M. ventralis*. *Hibiscus esculentus* was found to have *F. schultzei* (8.1%) as well as *H. gowdeyi* (4.1%) (Table 1).

Amaranthus hybridus showed the significantly highest number ($P < 0.05$) of thrips at all locations (Table 2), followed by *Solanum* spp. The vegetables in the Umuahia zone had the highest number of thrips followed by Owerri, Port Harcourt, Calabar and Enugu in descending order (Tables 2 and 3). There was a significant difference in the occurrence of thrips in Umuahia and Calabar or Enugu using Duncan's multiple rang test ($P < 0.05$). *Telfairia occidentalis* and *Hibiscus esculentus*, popular vegetables in Southeastern Nigeria, had little occurrence of thrips. The most frequent species at all localites was *Haplothrips gowdeyi*, whereas the

Table 1. Distribution of thrips on the sampled crops (%)

Crop	*Haplothrips gowdeyi*	*Frankliniella schultzei*	*Megalurothrips ventralis*
Amaranthus hybridus	39.9		
Amaranthus spinosus	25.7		
Solanum sp.		6.5	8.6
Solanum melongena		9.3	16.4
Solanum incanum			13.5
Basella rubra	3.1		12.3
Hibiscus esculentus	4.1	8.1	
Telfairia occidentalis	2.8		8.3

Table 2. Occurrence of thrips (in %) on the sampled crops in different locations in Southeastern Nigeria

Crop	Umuahia	Owerri	Port Harcourt	Enugu	Calabar
Amaranthus hybridus	63.4	54.6	38.8	18.1	24.4
Amaranthus spinosus	24.1	24.4	37.2	15.6	27.1
Solanum sp.	38.8	14.6	23.1	34.0	18.2
Solanum melongena	28.2	7.5	15.3	18.1	7.3
Solanum incanum	14.1	18.8	2.0	18.1	14.6
Basella rubra	7.4	18.3	7.3	28.4	15.6
Hibiscus esculentus	8.4	16.4	2.4	14.1	20.1
Telfairia occidentalis	14.3	21.1	7.4	7.1	5.6

Table 3. Incidence of occurrence (in %) of species of thrips at different locations in Southeastern Nigeria

Location	*Haplothrips gowdeyi*	*Frankliniella schultzei*	*Megalurothrips ventralis*
Umuahia	63.6	20.2	5.3
Owerri	54.6	0.0	30.8
Port Harcourt	38.8	31.1	7.1
Enugu	18.1	0.0	0.0
Calabar	24.4	15.6	16.2

least was *F. schultzei*, which was not detected in Enugu (Table 3). There was a significant difference in the occurrence of *H. gowdeyi* ($P < 0.05$) at the locations (Table 3).

DISCUSSION

The survey results showed clearly that all sampled crops were infested with thrips. This indicates that 100% of the vegetable crops in Southeastern Nigeria are host to one or the other species of thrips. This observation agrees very much with the findings of Davison and Lyon (1979) that thrips occur among all kinds of growing vegetation, on both flowers and foliage. Okwakpam (1967) also found that any plant in Nigeria is attacked by one or more thrips, especially in the northern region.

The number of species of thrips attacking each sampled crop varies. While some, e.g. *Solanum* sp. and *Solanum melongena*, were attacked by two species (*F. schultzei* and *M. ventralis*), the *Amaranthus* spp. was infested by only one – *H. gowdeyi*. This is in conformity with Higgins (1992) observation, in which he noted that different crops normally have a different number of species of thrips on them. While he found two species on tomatoes, he found barley infested by 29 species.

The main reason for this variation may be due to the nutritive value of the plants. Probably, the more infested host plants have more vitamins, minerals etc. It may also be due to some other qualities, like lower water content. Although analyses of the water content were not carried out, the leathery nature of the leaves of *Solanum* spp. for example could indicate that these may have a lower water content. Lewis (1973) and Chang (1991) observed that the susceptibility of different crops to infestation was induced by some environmental stress like water stress or drought. In our study there was also variation in the number of thrips found at the different locations. Enugu had the lowest number of thrips because it is located in a higher altitude (Okigbo 2001) with low moisture.

The population studies showed more variation in degree of abundance of number of thrips per flower/leaf. The most outstanding observation was that while the *Amaranthus* spp. with their heavy inflorescences supported 40% of thrips per leaf, *Telfairia* and *Hibiscus* with very simple flowers could only habour less than 10% thrips per flower/leaf.

This variation finds its solution in the fact that the inflorescences of *Amaranthus* are very dense, with numerous crevices provided by the bracts and spikelets of the flowers, and could thus accommodate more thrips per flower/leaf. This is supported by the fact that *Basella rubra* could support less than 16% of thrips per flower. The flower of this crop has no crevices and appears as a small nut, being covered completely by the sepals. All this agrees with the observations by Latimer and Oetting (1994) who pointed out that many thrips are interstitial dwellers and seek protection in narrow crevices. Flowers and grasses with dense inflorescences protect these interstitial dwellers, particularly the larvae, from exposure and desiccation as well as providing food, and that brushing reduces them. Another striking observation in our study concerned the *Solanum* sp. The *Solanum* sp., even though it has as simple flowers as *S. incanum*, supported more thrips per flower/leaf (25.7%) than *S. incanum* which had a lower number. It was noted that the leaves of *S. melongena* and *Solanum* sp. are hairy, whereas those of *S. incanum* are smooth. This is in agreement with observations of Taylor (1974) that hairy American and Indian varieties of cotton are more heavily attacked by thrips than the smooth-leafed African varieties.

The identification and taxonomic studies partly agreed with Okwakpam (1965) who also found *Frankliniella schultzei* on garden eggs. However, our findings on local garden egg did not confirm all those results because we detected *Megalurothrips*, while he found *Astrothrips pentatoma*. This may be attributed to the plants being at two different localities. Hommes (1992) pointed out that the same type of plant might be attacked by different types of thrips at different regions of the world. Or may be the *Megalurothrips* we found on this plant were superficial dwellers that had been carried to these crops by the wind.

The results also make clear that *H. gowdeyi* has a greater preponderance in infestation of the vegetable crops sampled, found on approximately 61% of the total crops sampled, especially at Umuahia, whereas *Franklinella* and *Megalurothrips* attacked only 20% each. However, it must be noted that the crops on which *H. gowdeyi* was found were those with either heavy inflorescences or with large simple flowers having larger sepals, petals and bracts. This conforms with the proposal by Lewis (1973) that the quality of food is less important to the wide range of plant families inhabited by the genus *Haplothrips* than the protection provided by dense inflorescences. And this can further be elaborated from the fact the *Amaranthus* spp. with dense inflorences were attacked by only this species, while on the other crops with simple flowers it is relatively lower in number, with other species of thrips being dominant.

It has thus become clear that all the sampled vegetable crops at all the localities hosted one or more species of thrips. Most of the damage inflicted on vegetable crops in some of these localities can, therefore, be attributed to the infestation by thrips, particularly *H. gowdeyi* which infested 61% of the sampled crops. However, it is interesting to note that *Telfairia occidentalis*, which is a preferred vegetable crop in this area, is sparsely infested by thrips.

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Souhrn

Oparaocha E.T., Okigbo R.N. (2003): **Třásněnky** (*Thysanoptera*) **na zelenině pěstované v jihovýchodní Nigérii**. Plant Protect. Sci., **39**: 132–138.

Na pěti lokalitách jihovýchodní Nigérie jsme odebrali vzorky z osmi druh zeleniny: *Amaranthus hybridus*, *A. spinosus*, *Basella rubra*, *Solanum incanum*, *S. melongena*, *Hibiscus esculentus*, *Telfairia occidentalis* a jeden druh *Solanum*. Zjistili jsme, že rostliny jsou napadeny jedním nebo několika druhy tásněnek. Vzorky byly odebírány na těchto lokalitách (četnost výskytu třásněnek): Umuahia (29,6 %), Owerri (28,5 %), Port Harcourt (25,7 %), Calabar (18,7 %) a Enugu (6,0 %). Sledování ukázalo, že plodiny s velmi bohatými květenstvími, jako např. *Amaranthus hybridus*, hostily vyšší počet třásněnek na květ/list, zatímco plodiny s jednoduchými květenstvími jako *Telfairia occidentalis* byly schopny hostit mnohem nižší počet třásněnek na květ/list. Je zřejmé, že třásněnky dávaly přednost rostlinám s bohatými květenstvími, která jim, a zejména jejich larvám, poskytovala více ochrany. Na základ taxonomického a mikroskopického studia jsme stanovili tři druhy třásněnek: *Haplothrips gowdeyi*, která napadla 63 % plodin, z nichž byly odebrány vzorky, *Frankliniella schultzei*, kterou hostilo 50 % daných plodin, a *Megalurothrips ventralis*, která se vyskytovala na 50 % zkoumaných vzorků rostlin.

Klíčová slova: třásněnky; zelenina; Nigérie

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