

# Incidence and Management of Peanut (*Arachis Hypogaea* L.) Rosette Disease in Southern Ghana

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**Abstract** – Germplasm from introduced and local sources were evaluated for resistance to PRD at Kwadaso (forest ecozone) and Hiawoannwu near Hiawoannwu (forest-transition ecozone) between 1999 and 2006. The efficacy of two local soaps, 'Alata' and 'Amonkye' on PRD infection were evaluated at Kwadaso, Hiawoannwu and Somanya. Chlorotic and green forms of PRD were prominent. Peanut germplasm demonstrating tolerance to rosette often yielded higher than those susceptible to rosette. Application of Local soaps in the study reduced the incidence of rosette due to impact on aphid (*Aphis gossypii* Golver) population. Results from these experiments indicate that the combination of improved cultivars and use of local-derived soaps have potential to minimize the negative impact of rosette on peanut production in Ghana.

**Keywords** – Improved Cultivars, Integrated Pest Management, Local Soaps, Peanut Germplasm.

**Running Title** – Incidence and Management of Peanut Rosette Disease.

## I. INTRODUCTION

Peanut is an important crop in Ghana and in sub-Saharan Africa [1] and contributes significantly to the agricultural GDP of Ghana. Peanut is cultivated for both subsistence purposes at the local and for regional export markets. Production of peanut is constrained by several factors and Peanut rosette disease (PRD) caused by a complex of three viral components, Peanut rosette assistor virus (GRAV, Hull and Adams), Peanut rosette virus (PRV, Zimmerman) genus umbravirus, and a satellite RNA which depends on PRV for its replication [2]-[4]. The virus is transmitted by *Aphis craccivora* and *A. gossypii* [5]-[6] For effective transmission and subsequent disease development all the three synergistic agents must be present in the host plant. Symptoms associated with the disease are variable but include chlorotic and green rosette. Plants when infected early produce progressively smaller, chlorotic, twisted and distorted leaflets, shorter internodes, stems thickened and become severely stunted as compared to asymptomatic plants [3].

PRD is one of the most yield limiting pests of peanut [7]-[8]. The quality of the haulm and pod is also affected by rosette [8]. A survey conducted in Southern Ghana (Lamptey *et al.*, unpublished data) indicated widespread occurrence of the disease in important peanut growing areas.

Previous studies using insecticides [3] indicate that rosette can be managed by control of the vector. However, resource poor farmers seldom use this approach due to resource and labor constraints [7]. Numerous studies have shown that aphids are difficult to control using synthetic insecticidal sprays because survivors quickly develop new colonies, they also become resistant to insecticides and virus is transmitted before aphids are killed by systemic insecticides [9].

Also resource poor farmers seldom use chemical control measures due to lack of resources, labour constraints and costs. Among other factors coupled with health hazards associated with the use of insecticides make the use of rosette resistant peanut varieties the most cost effective and environmentally friendly alternative [10]. Other studies have shown that aphids can be controlled by soaps [9]. In Ghana, however, no published information on the use of soaps as a foliar spray in the control of aphids and rosette in peanut is available.

This study which involved on-station trials was aimed to determine (i) the field resistance of some exotic and local lines to PRD in some agro-ecological zones in Southern Ghana and (ii) efficacy of local soaps on reducing incidence of rosette through suppression of aphids. These are important in developing management strategies for this important disease and consequently improve peanut production in Ghana.

## II. MATERIALS AND METHODS

### *Germplasm evaluation for reaction against rosette*

Thirty peanut lines introduced from the United States and one local control cultivar were evaluated for reaction to PRD under field conditions. The study was conducted at Kwadaso and Hiawoannwu in fields previously in peanut production with a history of rosette. After the initial trial,

fourteen exotic lines considered to be tolerant to PRD and two local controls were evaluated at Kwadaso and Hiawoannwu from 2003-2004. Seven lines were subsequently selected based on their tolerance to PRD and yield were further evaluated at Kwadaso, Kumasi (Lat, 6° 42' N; Long, 1° 40' W; 262 m above sea level) and Hiawoannwu (Lat, 7° 40' N; Long, 1° 39' W; 221.9 m above sea level) from 2005 to 2006 with three local cultivars. Seedbeds were prepared by hand tillage and peanut was planted using planting distance of 50 cm x 15 cm. Plot length was 6 m and consisted of eight rows. The experimental design was a randomized complete block with three replications. Peanut was planted at Kwadaso on June 4, 2006 and on May 22, 2006 at Hiawoannwu near Hiawoannwu. Air temperature ranged from 29–32° C and 31–34° C with relative humidity of 75–80% and 55–65% for Kwadaso and Hiawoannwu, respectively.

Disease incidence was determined by counting the number of plants which expressed rosette symptoms and as a percentage of total number of plants per plot. For disease severity, individual plants were visually assessed and scored on a 5-point scale [12] where: 1 = no symptoms of rosette, 2 = discernable rosette leaf symptoms. No stunting. (slight infection) 3 = rosette leaf symptoms plus stunting ranging from barely discernable to about 30% the size of symptomless plants (moderate infection) 4 = rosette leaf symptoms plus stunt ranging from about 30% to 70% (severe infection) and 5 = rosette leaf symptoms plus stunt greater than 70% (very severe infection). Plants which scored 2.0 or less were considered potentially tolerant while those which scored above 2.0 were considered as susceptible to GRD.

#### *Management of rosette with local soaps*

The effect of local soaps on rosette incidence and severity were evaluated at Kwadaso and Hiawoannwu during 2006 and also at Somanya and Hiawoannwu during 2007. The local soaps 'Alata' and 'Amonkye' were compared with untreated peanut (sprayed with only water) The cultivars RRR-ICGV 88709, an improved line obtained from CSIR-CRI Legume Breeding Program and 'Konkoma', a local cultivar were used. In 2006, two levels of concentrations i.e. 5 and 10 kg/ha were used for 'Alata' soap while that used for 'Amonkye' were 10 and 15 Kg/ha of water. In 2007, the lower concentration of 5kg/ha for 'Alata' and 10kg/ha for 'Amonkye' were used. Soaps were applied bi-weekly beginning two weeks after planting. The design in this management trial was also randomized complete block with treatments replicated three times. Assessment of rosette disease was recorded at 1 and 2 months after planting. Disease incidence was measured by counting the number of plants showing rosette symptoms and expressed as percentage of total number of plants/plot. For disease severity, the inner row plants were assessed using a 5-point scale described previously.

#### *Statistical analysis*

Data on disease incidence, severity, infection and yield (kg/ha) were analyzed using the general linear model [11]. Means were separated with Student Neuman Keul's (SNK) test at  $P \leq 0.05$ .

### **III. RESULTS AND DISCUSSION**

The performance of all the exotic lines and local checks in terms of percent disease infection and mean severity scores for the period of 1999 – 2001, 2004 – 2006 are shown in Tables I, II and III. Based on their resistance to PRD and soil pests (data not shown), 14 exotic lines and two local checks were selected for further evaluation. After the 2004 trials, seven exotic lines and three local checks were selected for further evaluation also based on their resistance to arthropod pests and diseases (including PRD) as well as pod yield. In all the station trials, the effect of PRD severity on peanut yields was clearly evident. For example in 2004 at Kwadaso when disease incidence and severity on most of the peanut lines was very high, lines which had PRD severity scores of 3.0 and above had significant yield losses in terms of kg/ha.

The results of the two year study on local soaps are shown in Tables IV, V and VI. The chlorotic as well as the green types of rosette were observed in all locations and they often appeared in mixtures. Aphids were also identified on the plants during the growing phase of the crop. In 2006, at Kwadaso, disease incidence was generally low for Konkoma and the improved cultivar, ICGV 88709. However, application of 'Alata' soap (level 2) on Konkoma controlled rosette as no disease was recorded and this was significant as compared to the control. For ICGV 88709, there was no rosette infection even without any soap treatment. At Hiawoannwu, when 'Konkoma' was sprayed using the two levels of 'Amonkye' soap significantly reduced rosette infection from 33.3 to 16.7% and 17.3% respectively. Application with two levels of the 'Alata' soap also significantly reduced rosette infection from 33.3% to 3.3% and 16.7% respectively. The two levels of 'Amonkye' and 'Alata' (level 2) soaps again significantly reduced severity of infection all indicating the effectiveness of the local soaps. For ICGV 88709, there were no differences between the control and the other treatments for percentage disease infection but spraying 'Amonkye' (level 2) and 'Alata' (level 2) significantly reduced severity of rosette on the improved cultivar.

In 2007, at Hiawoannwu, for 'Konkoma' application of 'Amonkye' and 'Alata' soaps produced a significant reduction in rosette infection from 36.7% to 25% and 21.7% respectively. With regards to diseases severity there were no differences between treatments. For ICGV 88709, there were no differences in disease infection and severity with or without soap treatment. At Somanya, for 'Konkoma' spraying with 'Amonkye' soap significantly reduced disease infection from 9% to 2.3%. However, there were no

differences between treatments in the severity of rosette. For ICGV 88709, there were no differences in disease infection and severity with or without soap treatment. Results from all the locations clearly indicated that the local soaps had a more significant effect on 'Konkoma' than the improved cultivar. The significant reduction in PRD infection due to soap treatment especially for 'Konkoma' reflected in the yields (kg/ha) (Tables VI and VII). Plots treated with the soaps significantly out yielded those without any treatment.

The results from all the locations in this study rather indicate the use of local soaps as effective in reducing the incidence and impact of rosette. Since pesticides normally do not have direct effect on virus particles it could be inferred from this study that the 'Alata' and 'Amonkye' soaps possess insecticidal properties which act on the aphids which are known vectors of rosette disease infection. This confirms the observations made by [9] and [12] that soaps control aphids. [13] reported that insecticidal soaps used to control aphids contain potassium salts of fatty acids and they are effective in controlling aphids. The local soaps used in these trials incidentally do have such properties. [14] reported that soaps with insecticidal properties penetrate and disrupt the cellular membranes of target pests and kill them and such soaps have been used to control soft-bodied pests including aphids. [15] observed that the most serious potential drawbacks to the use of soaps is their phytotoxicity and advised that to prevent plant injury soaps should be diluted to no more than two to three percent. Initial interest in the soaps focused on a potential effect on early and late leaf spots but personal observations made at all locations indicated that the soaps did not reduce leaf spot incidence and in some sprayed spots a higher infection of leaf spots as compared to non-sprayed plots was observed.

It was evident in all the locations, regardless of the soap treatment, the improved cultivar which possessed some level of rosette resistance performed better than the susceptible local variety 'Konkoma'. This indicates that the use of a rosette resistant variety is likely to produce higher yields even without the use of soaps. Farmers or consumers who still prefer the susceptible local varieties, it is clear that the use of these local soaps will reduce the impact of rosette incidence and severity on the peanut and thus improve yields. [13] also indicated that soaps apart from being effective in the control of aphids are safe for people and the environment. Other advantages of using soaps as bio-pesticides are that they are cheaper and more selective and have minimal adverse effect on beneficial organisms [15]. The results from the on-station trials clearly show that peanut rosette disease has a damaging effect on peanut yields and that the use of resistant/tolerant cultivars might be the most effective way of managing the disease. These findings are also supported by several national programs in sub-Saharan Africa who regard the use of host-plant resistance to the virus complex as the most effective management strategy in smallholder farming systems.

Table I: Mean severity scores for 30 peanut lines evaluated for resistance to peanut rosette disease at Kwadaso from 1999-2001.

Peanut lines	Mean severity scores†		
	1999	2000	2001
ICG(FDRS) – 32	1.0	2.0	2.3
ICG(FDRS)-20(X)F-MIX-38	1.3	1.0	1.3
RRR ICGV 88709	1.0	2.0	1.7
ICG X SM 87057	2.7	2.7	1.3
RRR-UGA 12	1.0	1.7	2.0
NC-IOC	2.7	1.7	1.0
RRR-RMP 12	1.7	2.3	1.0
SHITAOCHI*	3.3	2.3	1.3
SOUTHERN RUNNER	1.0	1.7	1.8
AADRO 9B	2.7	1.3	1.3
AT-120	1.0	2.7	2.0
93B	1.0	1.7	1.8
RRR –UGA-8	1.7	1.7	2.3
NCV 11	1.3	2.3	1.0
RRR-UGA-9	2.0	1.7	1.7
NC 12C	1.0	1.0	1.7
RRR-MDR-8-19	1.0	1.0	1.0
ICGX-SM 89029	2.3	1.3	1.3
ICGV 87160	2.0	2.7	1.7
RRR-MDR-8-16	1.7	1.7	1.0
RRR-MS76-79	1.0	1.0	1.3
F MIX(X) ICG 20-1-45	2.0	1.7	1.0
GA GREEN	2.0	1.7	1.3
GK 7 HIGH OLEIC	1.7	1.7	1.7
F MIX(X)ICG(FORS) 20-1-35	1.7	1.0	1.3
RRR-M249-74	1.0	1.3	1.0
ICGV 86556	1.7	1.7	1.0
SINKARZEI*	1.7	1.7	1.0
NC 7	1.0	2.0	1.7
ICGV SM 86047	1.7	1.3	1.7

Note: \*Local check; † data on disease severity was collected and peanut lines were advanced to the next stage based on GRD severity threshold of 2.0 or below.

Table II: Mean severity scores, % infection and yield (kg/ha) for 16 peanut lines evaluated for resistance to GRD at Kwadaso and Hiawoannwu in 2004

Peanut lines	Hiawoannwu			Kwadaso		
	Sev.	% inf.	Yield (kg/ha)	Sev.	% inf.	Yield (kg/ha)
ICG (FDRS)	1.5±0.0ab	10.0±0.0b	507.60±44.53ab	3.2±0.0c	60.0±2.1cd	54.87±54.87
ICGV 88709	1.0±0.0c	0.0±0.0f	670.60±149.35ab	1.7±0.0d	15.0±0.0f	362.93±95.02
ICG X FM 87057	1.0±0.0c	0.0±0.0f	500.30±75.27ab	1.3±0.0e	18.0±0.0f	291.63±161.93
RRR-UGA-12	1.0±0.0c	0.0±0.0f	881.37±198.14ab	2.2±0.0d	20.5±1.5f	398.86±56.36
SHITAOCHI*	1.0±0.0c	0.0±0.0f	397.40±41.25ab	3.2±0.0c	50.0±0.0d	301.07±167.43
S. RUNNER	1.7±0.2a	20.0±0.0a	366.40±42.32ab	5.0±0.0a	90.0±3.7a	0.00±0.0
AT 120	1.0±0.0c	0.0±0.0e	737.53±146.37ab	1.2±0.0e	16.5±0.0f	482.83±116.30
NCV 11	1.4±0.0b	15.0±0.0bc	277.83±84.04b	5.0±0.0a	80.0±4.1b	0.00±0.0
ICGXSM	1.4±0.0b	2.5±0.0d	402.23±150.14ab	4.0±0.0b	50.0±0.0d	107.33±107.33
RRR-MDR	1.2±0.0bc	1.8±0.0e	754.43±106.92ab	1.8±0.0d	20.0±0.0f	353.60±93.22
RRR-M576	1.0±0.0c	0.0±0.0e	603.43±177.57ab	1.6±0.0d	15.0±0.0f	360.60±83.62
FMIX(X) ICG	1.0±0.0c	0.0±0.0e	239.37±38.29b	1.3±0.0e	13.5±0.0f	482.73±135.76
GA GREEN	1.7±0.1a	5.0±0.0d	347.13±45.43ab	5.0±0.0a	70.0±0.0c	231.77±174.53
GK 7 OLEIC	1.0±0.0c	0.0±0.0f	495.70±53.30ab	2.3±0.0d	45.0±0.0e	293.57±171.44
FMIX(X) ICG	1.4±0.0b	2.0±0.0e	507.60±44.53ab	4.5±0.0b	80.0±2.5b	40.53±40.53
SINKARZEI*	1.5±0.0ab	2.5±0.0d	704.00±109.38ab	4.0±0.0b	60.0±0.0cd	183.93±30.56
P > F	0.0023	0.0019	0.0059	0.0067	0.0014	0.0247

**Note:** \* Local checks; <sup>a</sup> Means within a region and column followed by the same letter are not significantly different according to the SNK test at  $p > 0.05$ .

Table III: Mean severity scores, % infection and yield (kg/ha) for ten peanut lines evaluated for resistance to GRD at Kwadaso and Hiawoannwu in 2006.

Peanut lines	Hiawoannwu			Kwadaso		
	Sev.	% inf.	Yield (kg/ha) ± s.e.	Sev.	% inf.	Yield (kg/ha) ± s.e.
AT 120	2.2±0.0b	6.7±0.1bc	1167.48±10.72c	1.7±0.0ab	4.7±0.0a	661.65± 8.26d
FMIX(X) ICG	1.7±0.1c	6.7±0.0bc	1145.75± 4.13c	1.3±0.0c	1.3±0.0c	953.03± 3.50a
GK 7 OLEIC	2.2±0.0b	5.0±0.0c	1226.18±13.18b	1.7±0.0ab	4.7±0.0a	785.43± 3.50c
ICGV 88709	2.0±0.0bc	6.7±0.0bc	1233.18± 8.68b	2.0±0.0a	2.0±0.0ab	801.92±11.12c
RRR MDR	1.7±0.0c	3.0±0.0d	1240.21± 5.88b	1.0±0.0c	0.0±0.0d	659.04± 6.23d
RRR-UGA	2.0±0.0bc	7.3±0.0b	1094.66± 8.64d	2.0±0.0a	2.7±0.0b	653.74± 4.37d
ICG-X FM-87057	2.0±0.0bc	8.3±0.2b	963.80± 4.10a	1.0±0.0c	2.0±0.0b	644.47± 0.81d
SINKARZEI*	2.8±0.2a	6.7±0.0ab	1229.43± 6.38b	2.0±0.0a	2.0±0.0b	784.10± 3.10c
SHITAOCHI*	1.7±0.0c	3.3±0.0d	1768.84± 6.36e	1.7±0.0ab	1.2±0.0c	930.91± 4.04b
KONKOMA*	3.0±0.1a	30.0±1.5a	568.54± 6.49f	1.7±0.0ab	0.0±0.0d	361.47± 3.91e
P > F	0.0076	0.0048	0.0001	0.0054	0.0032	0.0001

**Note:** \* Local checks; <sup>a</sup> Means within a region and column followed by the same letter are not significantly different according to the SNK test at  $p > 0.05$

Table IV. Mean % infection and mean severity scores of GRD (2 MAP\*) on peanut lines sprayed with local soaps at Hiawoannwu and Kwadaso, 2006

Treatments	Mean % infection		Mean severity scores (1-5)	
	Kwadaso	Hiawoannwu	Kwadaso	Hiawoannwu
Water - ICGV 88709	0.0±0.00b	5.0±0.00d	1.0±0.00a	1.5±0.50ab

Amonkye 1-ICGV 88709	0.0±0.00b	5.0±0.00d	1.0±0.00a	1.7±0.67ab
Amonkye 2-ICGV 88709	0.7±0.67ab	0.0±0.00d	1.3±0.33a	1.0±0.00b
Alata 1 - ICGV 88709	0.0±0.00b	3.3±0.33d	1.0±0.00a	1.5±0.50ab
Alata 2 - ICGV 88709	1.3±0.67ab	0.0±0.00d	1.7±0.33a	1.0±0.00b
Amonkye 1 - Konkoma	2.0±0.00ab	16.7±1.67c	2.0±0.58a	2.3±0.17ab
Amonkye 2 - Konkoma	1.3±0.67ab	17.3±2.67c	1.3±0.33a	2.2±0.17ab
Alata 1 - Konkoma	2.7±0.67a	26.7±3.33b	2.0±0.58a	2.8±0.17a
Alata 2 - Konkoma	0.0±0.00b	16.7±3.33c	1.0±0.00a	2.0±0.58ab
Water - Konkoma	1.3±0.67ab	33.3±3.33a	1.3±0.33a	3.2±0.16a
P > F	0.0042	0.0001	0.4200	0.0063

Note: \* MAP – Months after planting; <sup>a</sup> Means within a region and column followed by the same letter are not significantly different according to the SNK test at p > 0.05.

Table V: Mean % infection and mean severity scores of GRD (2 MAP\*) on peanut lines sprayed with local soaps at Hiawoannwu and Somanya, 2007

Treatment	Mean % infection ± s.e.		Mean severity scores (1-5) ± s.e.	
	Hiawoannwu	Somanya	Hiawoannwu	Somanya
Water - ICGV 88709	0.0 ± 0.00c	1.7±0.33b	1.0 ± 0.00b	1.3 ± 0.33a
Amonkye-ICGV 88709	0.0 ± 0.00c	1.7±0.33b	1.0 ± 0.00b	1.3 ± 0.33a
Alata - ICGV 88709	0.0 ± 0.00c	1.7±0.33b	1.0 ± 0.00b	1.3 ± 0.33a
Amonkye - Konkoma	25.0 ± 2.89b	2.3±0.33b	2.7 ± 0.33a	2.3 ± 0.67a
Alata – Konkoma	21.7 ± 1.67b	10.0±0.00a	2.5 ± 0.29a	2.3 ± 0.67a
Water – Konkoma	36.7 ± 3.33a	9.0±1.00a	3.0 ± 0.00a	2.3 ± 0.33a
P > F	0.0001	0.0001	0.0001	0.3090

Note: \* MAP – Months after planting; <sup>a</sup> Means within a region and column followed by the same letter are not significantly different according to the SNK test at p > 0.05.

Table VI: Yields of peanut in local soaps trials at Kwadaso and Hiawoannwu in 2006

Treatment	Yield (kg/ha) ± s.e.	
	Kwadaso	Hiawoannwu
Water - ICGV 88709 (control)	630.65± 30.19e	659.88± 30.30f
Amonkye 1 - ICGV 88709	1068.71± 33.16a	1023.81± 8.68a
Amonkye 2 - ICGV 88709	1009.74±14.30b	1012.74± 4.06a
Alata 1 - ICGV 88709	930.11± 5.10c	1139.39± 24.99a
Alata 2 - ICGV 88709	825.06± 5.65d	949.19± 13.15b
Alata 1 - Konkoma	896.14± 5.41c	662.17± 6.40f
Alata 2 - Konkoma	654.14±10.91e	786.60± 4.11e
Amonkye 1 - Konkoma	928.44± 8.80c	894.63±11.12c
Amonkye 2 - Konkoma	572.87± 7.50f	835.62± 8.20d
Water - Konkoma (control)	515.29±17.80g	486.66± 19.43h
P > F	0.0001	0.0001

Note: Means within a region and column followed by the same letter are not significantly different according to the SNK test at p > 0.05

Table VII: Yields of peanut in local soaps trials at Hiawoannwu and Somanya in 2007

Treatments	Yield (kg/ha) ± s.e.	
	Hiawoannwu	Somanya
Alata – ICGV 88709	1624.75±100.01a	2060.49± 6.03a
Amonkye – ICGV 88709	1524.88± 81.10a	1814.78±26.60b
Water – ICGV 88709 (control)	1467.63±47.35a	1531.54± 9.45c

Alata – Konkoma	681.55±15.52b	847.71± 8.73e
Amonkye – Konkoma	461.60± 0.68c	952.97±17.91d
Water – Konkoma (control)	318.70±5.67c	796.36±18.80f
P > F	0.0001	0.0001

**Note:** Means within a region and column followed by the same letter are not significantly different according to the SNK test at  $p > 0.05$ .

#### IV. CONCLUSION

In conclusion, the National Varietal Release Committee in Ghana has in 2012 released two of the varieties (ICGV-88709 and ICGV-XFM-87057) which were found to be resistant to PRD in this study. This will help improve farmers' income and their livelihood and also boost the Ghanaian economy. It was also obvious from this study that local soaps were effective in reducing incidence and severity of rosette disease. The low market price of the soaps and the dilute concentrations used in this study demonstrate that combining host resistance and the use of local soaps may offer the best option for the poor resourced farmer for rosette management. For farmers who for obvious reasons would still prefer to grow the local varieties, the use of soaps will provide the best option for rosette management.

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#### REFERENCES

[1] H.K. Adu-Dapaah, J.N.L. Lamptey, J. Haleegoah, and B. Asafo-Adjei (2007) Farmer Participation in Groundnut Varietal Selection. *African Crop Science Conference Proceedings* pp. 1435-1439.

[2] V. Blok, A. Ziegler, K. Scott, D. Dangora, D. Robinson *et al.* (1995) Detection of groundnut rosette umbravirus infections with radioactive and non-radioactive probes to its satellite RNA. *Annals of Applied Biology* 127: 321-328.

[3] K. Bock, A. Murant, and R. Rajeshwari (1990) The nature of the resistance in groundnut to rosette disease. *Annals of Applied Biology* 117: 379-384.

[4] A. Murant, R. Rajeshwari, D. Robinson, and J. Raschke (1988) A satellite RNA of groundnut rosette virus that is largely responsible for symptoms of groundnut rosette disease. *Journal of General Virology* 69: 1479-1486.

[5] R. Hull and A. Adams (1968) Groundnut rosette and its assistor virus. *Annals of Applied Biology* 62: 139-145.

[6] R. Naidu, F. Kimmins, C. Deom, P. Subrahmanyam, a.A. Chiyembekeza *et al.* (1999) Groundnut rosette: a virus disease affecting groundnut production in sub-saharan Africa. *Plant Disease* 83: 700-709.

[7] K.O. Marfo, N.N. Denwar, H.K. Adu-Dapaah, B. Asafo Agyei, K.A. Marfo, J. Adjei and J. Haleegoah (1999) Groundnut production in Ghana. *Proceedings of a national workshop on groundmised peanut aflatoxins*. Kumasi, Ghana. pp. 11-16.

[8] H.K. Adu-Dapaah, J.Y. Asibuo, Danquah OA, Asumadu H, Haleegoah J, Asafo-Adjei B. Farmer participation in groundnut

rosette resistant varietal selection in Ghana. In: Al Fe, editor; 2004; Brisbane, Australia

[9] R. Moschetti (2003) The Problem: Aphids. *Technical Bulletin: Greenhouse Management Series*. Wasilla, Alaska. pp. 4.

[10] H.K. Adu-Dapaah, J.V.K. Afun, F. Padi, C. Oti-Boateng (2007) Groundnut Production Guide: *A technological package for Agricultural Extension agents and Farmers*. In: Osei CK, Berchie, J.N. and Gyasi-Boakye, S, editor. Kumasi: Ministry of Food and Agriculture. pp. 26.

[11] SAS (2008) *SAS Users guide*. Cary, NC, USA: SAS Institute.

[12] C. Caroline (2004) Managing aphid problems without pesticides. *Journal of Pesticide Reform* 24: 8-9.

[13] E.A. Buss (2006) Aphids on landscape plants. Florida, USA: University of Florida. pp. 6.

[14] L.L. Strand (1999) Integrated pest management for stone fruits: UCANR Publications.

[15] W. Cranshaw (1996) Insect control: soaps and detergents: Colorado State University Extension Service.

#### AUTHOR'S PROFILE



#### **Dr. Joseph Nee Lante Lamptey**

was born in Cape Coast, Ghana on 28<sup>th</sup> February, 1956. Lamptey holds a BSc.Hons (Agric) (1981) and M. Phil (Plant Pathology) (1987) from the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana. He holds PhD in Plant Virology (1996)

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He currently works at the Council for Scientific and Industrial Research (CSIR)-Crops Research Institute (CRI), Kumasi, Ghana. He is a PRINCIPAL RESEARCH SCIENTIST and the Deputy Director of the Institute and the Head of the Plant Pathology Section. He is also a part-time Lecturer at the Crop and Soil Sciences Department, Faculty of Agriculture, KNUST. His research activities include diagnosis and control of fungal and viral diseases on cereal, (rice) legume (cowpea and groundnut), root and tuber (yam, cassava, cocoyam, taro and Sweetpotato) and tropical fruit (citrus) crops. He has worked as a Plant Pathologist/Virologist on the National Root & Tuber Crops Improvement Programme (1988-1992), National Agricultural Research Project (NARP) for Root & Tuber & Vegetable crops (1996-1998), Crops Research Institute (CRI)/Natural Resources Institute (NRI)/Savanna Research Institute (SARI) Yam disease project (1999-2000), Agricultural Sub-sector Improvement Project (AgSSIP) on Tropical Fruit, Legume & Vegetable crops (2000-2003), North Carolina State University (NCSU)/ CRI Peanut project (2000 to present), West African Agricultural Productivity Programme (WAAPP) on Root & Tuber Crops (2008 to present), Alliance for a Green Revolution in Africa (AGRA) project on cowpea thrips & *Cercospora* leaf spot resistance (2008 to present), Food & Agriculture Budgetary Support (FABS)/ Canadian International Development Agency (CIDA) project on rice yellow mottle virus (2009-2013), United States Agency for International Development (USAID) CRSP Integrated Management Project on Tomato (2009 to present) and Korea-Africa Food & Agricultural Cooperation Initiative (KAFACI) project on Tomato (2012 to present). He has several peer reviewed publications in both International and local journals to his credit. These include:

Lamptey, J.N.L., Plumb, R.T. & Shaw, M.W. (2003). Interactions between the Grasses *Phalaris arundinacea*, *Miscanthus sinensis* and *Echinochloa crus-galli* and Barley and Cereal Yellow Dwarf Viruses. *Journal of Phytopathology* 151,1-6.



Lamprey, J.N.L., Dzomeku, B.M., Anno-Nyako, F.O., Banful, B. & Hughes, J'd (2007) Banana streak disease survey in three plantain growing regions of Ghana. *International Journal of Virology*. 3 :96-99.

Lamprey, J.N.L., Osei, M.K., Mochiah, M.B., Osei, K., Berchie, J.N., Bolfrey-Arku, G. & Gilbertson, R.L. (2013). Serological detection of *Tobacco mosaic virus* and *Cucumber mosaic virus* infecting tomato (*Solanum lycopersicon*) using a lateral flow immunoassay technique. *Journal of Agricultural studies* 1: 102-113.

Dr. Lamprey is a member of the Ghana Science and Horticultural Associations of Ghana, Research Staff Association, Council for Scientific & Industrial Research, International Society of Tropical Root Crops–Africa Branch and Association of African Agricultural Professional in the Diaspora. He was a Visiting Fellow to the International Institute of Tropical Agriculture, Ibadan, Nigeria in 2003. As a contributor to several breeding programmes he is credited with the release of thirty eight improved varieties of several crops including cassava, yam, sweet potato, groundnut, cowpea and plantain. He has also been involved in a lot of technology transfer as well as training of trainers programmes in Ghana. He was a consultant for the Millenium Development Authority Programme (Ghana MCA compact) as a Training Service Provider from 2008 to 2011. He was jointly awarded the second best presenter in the 8<sup>th</sup> Triennial Symposium of the International Society of Tropical Root crops – Africa Branch in 2001.



### Dr. M. B. Mochiah

was born in Ghana on 6<sup>th</sup> May 1963 and holds a B.Sc. (Hons.) degree in Zoology/Botany and M.phil (Entomology) from the University of Cape Coast, and Ph.D (Agricultural Entomology) from University of Cape Coast/ International Centre of Insect Physiology and Ecology (ICIPE) in Nairobi Kenya under a split programme. He also holds Diploma in Education from University of Cape Coast, Ghana. He was a researcher and demonstrator during his M.phil programme at the Department of Zoology of the University of Cape Coast in 1994/5. He was a postgraduate research fellow at International Centre of Insect Physiology and Ecology (ICIPE) in Nairobi Kenya under the German Academic Exchange (DAAD) PhD fellowship.

He has varied research interests in Integrated Pests Management (IPM), ecology of insect pests and beneficial insects leading to biological control. He is currently involved in the development of integrated management strategies for pests of vegetables (cabbage, tomatoes, okra, pepper and eggplant), root and tuber crops (cassava and cocoyam), legumes (cowpea and groundnut) and other CRI mandated crops.

Dr. Mochiah has the following local and international affiliations: 1) Member of the African Association of Insect Scientists (AAIS), 2) Member of the International Society of Organic Agriculture Research (ISO FAR), 3) Member of African Regional Postgraduate Programme in Insect Science Scholars Association (ASA) and 4) Member of CSIR- Research Staff Association (RSA). He has a good number of peer reviewed publications in international journals (three of such are listed below):

1. Mochiah, M.B., Owusu-Akyaw, M., Bolfrey-Arku, G., Osei, K., Lamprey, J.N.L., Adama, I., Amoabeng, B.W., Brandenburg, R.L and Jordan, D.L. (2013). The use of sugar baits for the integrated management of soil arthropod pests in peanut (*Arachis hypogaea* L.) in Ghana, West Africa. *African Entomology*. 21 (2): pp. 267-272.
2. Mochiah, M.B., Baidoo, P.K. and Acheampong, G. (2012). Effects of mulching materials on agronomic characteristics, pests of pepper (*Capsicum annum* L.) and their natural enemies' populations. *Agriculture and Biology Journal of North America* 3(6): 253-261.
3. Mochiah M.B., Banful B., Fening K.O., Amoabeng B.W., Offei Bonsu K., Ekyem S.O, Braimah H. and Owusu-Akyaw M. (2011). Botanicals for the management of insect pests in organic vegetable production. *Journal of Entomology and Nematology* Vol. 3 (8): 85-97.