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Assessment of Important Diseases of Major Fruit Crops (Mango, Avocado, Papaya and Orange) in South Omo Zone of Ethiopia

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Abstract
Production and productivity of Mango, Avocado, Papaya and Orange is highly threatened by different diseases in South Omo zone of Southern Nation Nationality Peoples Region state of Ethiopia. However, the relative importance of each disease across locations has not been assessed and well profiled to create sound management strategy. With the objective of determining the occurrence, distribution and the status of these fruit diseases in the zone , survey was carried out in four kebeles of South Ari districts of South Omo zone i.e. Metser,Baytsemal,Shekamer and Geza (South Ari woreda) in 2014 cropping seasons. The result revealed that the highest mean infection ofAnthracnose(35.71%) and (32.5%) in mango were recorded at Metser and Bytsemalkebeles of South Ari woreda respectively mine while (85%) and (40%) of anthracnose in Avocado were recorded at Metser and Shekamerkebeles of South Ari woreda of South Omo zone respectively. In addition at Metser and Baytemalkebeles of South Ari woreda 77% and 32.5% of powdery mildewwere recorded as the highest mean infection of Avocado and Mango, respectively. The mean infectionof Orange by fruit rot and powdery mildew was 12.5% and 30.25% respectivelyat Baytsemalkebele of South Ari woreda. The current study indicated that a complex of fruitdiseases exists on different fruit crops at different locations and the occurrence across kebeles is highly variable despite of introduction and promotion of different management practices so, holistic and cumulative integrated approach is required to manage the complex diseases in the surveyed areas.
Keywords: Diseases, assessment, pathogens

1.Introduction

Fruit are among the most important and interesting food crops that are produced in the tropical regions of the world (Martin *et al*., 1987; Nakasone and Paull, 1998). In many ways, they exemplify the exotic nature of the tropics.In addition to the monetary importance of these fruit is their place in the everyday lives ofpeople in the tropics (Martin *et al*., 1987). They possess a wide array of nutritional qualities,and may contain significant amounts of vitamins, minerals, oils, starches and protein. Theyare dessert items that add flavor and variety to the diets of many.In the future, demand for tropical fruit will increase in and outside the tropics.

Ethiopia has a comparative advantage in a number of horticultural commodities due to its favourable climate, proximity to European and Middle Eastern markets and cheap labour. However, the production of horticultural crops is much less developed than the production offood grains in the country (MoA,2006).

According to recent information obtained from the Central Statistics Authority, the total areaunder fruits & vegetables is about 12,576 hectares in 2011. Of the total land area under cultivation in the country during the same year, the area under fruits and vegetables is less than one per cent (i.e. 0.11%), which is insignificant as compared to food crops.

Fruit production is one of the major sources of cash income for farmers living in South Omo zone of SNNPR. It is the third major house hold source of income next to crop and livestock production for farmers in the region (BoA, 2006). The zone has divers' climatic conditions which range from arid lowland areas to moist highland areas that make the zone suitable for very divers' kinds of fruits production. Among fruit trees planted in the zone mango, avocado, papaya, citrus, zyton are the major ones. Due to its ability to withstand climate change, lower lever requirement and higher market value, fruit production is very attractive business at these times. In South Omo zone of SNNPR Farmers use fruit trees for different purposes like fire wood, as a construction material, fruit production and for soil and water conservation.As productionincreases to meet these demands, information on the diseases that impact the healthof these crops will be vital. Diseases often are the most important constraint to the productionof tropical fruit. They indirectly reduce yields by debilitating the plant, and directlyreduce the yield or quality of fruit before and after they are harvested. Failure to recognizeand manage these diseases successfully can result in catastrophic losses (Randy C. P and John A.M, 2003) .

Among the major diseases (Anthracnose, Powdery mildew and rust) on mango , (Anthracnose, dieback) on avocado , Wood rots , Scab (fruit & leaf), *Phytophthora* trunk canker, Leaf spots, Anthracnose, Powdery mildew andSooty mold on citrus are some of diseases reported by many literatures.

As mentioned above the South Omo zone of SNNPR (Southern Nation and Nationality and people Regional State) has suitable climatic condition for the production of divers fruit crops however there is a great amount of pre-harvest as well as post-harvest loss of fruits in the zone due to many factors . Among them loss due to fruit diseases took the lion share. So that surveying and documenting these major fruits diseases, their

distribution, intensity, severity and their relation to weather factors have higher importance so, that the current survey was conducted to assess and document the major disease constraint which hinders fruit production in South Omo zone..

2. Material and method

Survey was conducted on major fruit trees which include mango, avocado, papaya and citrus. Before making filed survey secondary data were collected from South Omo zone agriculture and rural development office and South Ari district agricultural and rural development office and other stack holders involved in the fruit production and marketing in the zone. During secondary data collection data like area of production potential, annual production, major disease of fruit, their occurrence, intensity, distribution and seasonality was assessed.After secondary data collection the field survey was conducted. Sites and farmers selection were carried out through discussion with zonal and woreda agricultural offices and through observation of secondary data and field observations of preliminarily selected woreda. From selected woreda four (4) potential kebeles were selected and field survey was undertaken. From each selected kebeles farmers who are involved in fruit production were selected and interviewed. Around 10 farmers from each selected kebele were included in the survey.

Farmers were interviewed with semi structured questionnaires about type of fruit crops they planted , its production potential, marketing and the major types of fruit diseases, the part of the fruit crops attacked and damagedby the disease ,there economic importance their frequency, the time of occurrence ,its symptoms, severity, its relation with weather condition, how farmers are trying to control those diseases (type of control measures they are using), effectiveness of control measures ,the marketability of diseased fruits, the growth stage of the plant at which the disease occur and other important data were collected.

After interviewing the farmers we moved to the fieldsto observe the fruit trees. From farmers' field we took two to three trees from each fruit crops and detailed disease observation were undertaken.

Incidence and severity of different disease were recorded from each fruit crops. Diseases assessment were done in 40 farmers' fields in 4 kebelesof South Ari district. The studiedkebeles were Metser, Shekamer, Geza and Baytsimalkebeles of South Ari woreda.Fromeach kebeles, 10 plants of each fruit crops were evaluated.

Diseases were recorded in belg season (January-February 2014) both on the leaf, stem and fruits. The incidence and severity data were taken from sampled plant. Data were expressed in percentage. The formula for calculating the diseases incidence and severity were:

% Incidence=Number of Leaves/Fruits/stems infected x100Total Number of Leaf/Fruits/Stem Counted

%Severity=Sum of all disease ratings x 10 Total number of leaves/fruits/stems x maximum rating value

For estimation of diseased area ofleaf, stem and fruits, the whole, stem and fruits and leaf surface area considered as 100%.The infested area was determined by eye estimation for both of diseases incidence and severity. Identification of most of the disease was made under field condition with the help of field guide books and other reference.

3. Result and Discussion

Assessment on major diseases of Mango, Avocado, Papaya and Orange was undertaken at South Omo zone of South Ari woreda inMetser, Baytsimal, Geza and Shekamerkebeles. Incidence and severity are the major tools for measuring the diseases. Seven diseases were recorded in South Ari district of South Omo zone. Mango, Papaya, Orange and Avocado are the major fruit crops in South Ari woreda of South Omo zone. Major pathogens that causes diseaseson Mango are *C.gloeosporioides, Odium mangiferae,Lasiodiplodiatheobromae,Xanthomonascampestrispv.mangiferaeindicae,*and*Rhizoctoniasolanikuhn*(Tabel).Whereas on Avocado the major diseases causingpathogen are*C.gloeosporoides ,Oidiumspp* and *Fusarium spp*. In additionto Mango andAvocado, Papaya and Orange are the major fruit crops in high and mid land of SouthAri woreda of South Omo zone. The pathogens that cause diseases on these fruit crops in the woreda are *Phytophthorapalmivora, Pythiumaphanidermatum, Odium caricae*and*Phytophtoraparasitica* on papaya and *Acrosporiumtingitanium*and *Phytophthoraspp.* on Orange.

Table1: Identified Diseases and Infection level (%) onMajor Fruit Crops

Crop/host	*Disease*	*Pathogen*	*Incidence (%)*	*Severity (%)*
Mango	**ANT**	*C.gloeosporioides*	30.23	70
	PM	*Odiummangiferae*	26.55	55
	DB	*Lasiodiplodiatheobromae*	21.42	30
	BC	*Xanthomonascampestrispv.mangiferaeindicae*	20.71	25
	D.OFF	*Rhizoctoniasolanikuhn*	9.82	18
Avocado	**ANT**	*C.gloeosporoides*	42.32	60
	PM	*Oidiumspp*	37.83	50
	DB	*Fusariumspp*	31.07	25
Papaya	**FR**	*Phytophthorapalmivora*	14.77	20
	SR	*Pythiumaphanidermatum*	14.77	15
	PM	*Odium caricae*	24.3	15
	D.OFF	*Phytophtoraparasitica*	25	25
Orange	**PM**	*Acrosporiumtingitanium*	23.4	30
	FR	*Phytophthoraspp*	12.5	10

PM=powdery mildew, ANT=anthracnose, DB=dieback, D.OFF=damping off and FR=fruit rots=stem rot, BC=bacterial canker

Table2: Identified pathogen and Infection level (%) on MajorFruit Crops at 4 Kebeles

Woreda	*Kebele*	*Fruit crop*	*Pathogen*	*Incidence (%)*
South Ari	**Mytser**	**Mango**	*Lasiodiplodiatheobromae*	7.14
			C.gloeosporioides	35.71
			Xanthomonascampestrispv.mangiferaeindicae	21.42
			Rhizoctoniasolanikuhn	7.14
			Odiummangiferae	21.42
		Avocado	*C.gloeosporoides*	85
			Fusariumspp	60
			Oidiumspp	77
		Papaya	*Phytophthorapalmivora*	10
			Pythiumaphanidermatum	10
		Orange	**-**	0
	Baytsemal	**Mango**	*c.gloeosporioides*	32.5
			Odiummangifererae	32.5
		Avocado	*Fusariumspp*	30
			Oidiumspp	30
			C.gloeosporoides	30
		Papaya	*Phytophthorapalmivora*	14.3
			Pythiumaphanidermatum	14.3
			Odium caricae	24.3
		Orange	*Acrosporiumtingitanium*	30.25
			Phytophthoraspp	12.5
	Shekamer	**Mango**	*Xanthomonascampestrispv.mangiferaeindicae*	20
			Odiummangifererae	40
		Avocado	*C.gloeosporoides*	40
			Fusariumspp	20
			Oidiumspp	20
		Papaya	*Phytophthorapalmivora*	20
			Pythiumaphanidermatum	20
		Orange	*Acrosporiumtingitanium*	20
	Geza	**Mango**	*C.gloeosporioides*	22.5
			Rhizoctoniasalanikuhn	12.5
		Avocado	*C.gloeosporoides*	14.28
			Oidiumspp	24.3
			Fusariumspp	14.28
		Papaya	*Phytophtoraparasitica*	25
		Orange	*Acrosporiumtingitanium*	20

AnthracnoseVerticilium wilt

The highest mean infection of anthracnose (*C.gloeosporioides)*35.71% and 32.5% in mango were recorded at Maytser and Bytsemalkebeles of South Ari woreda respectively. Meanwhileat Maytser and Shekamerkebeles of South Ari woreda of South Omo zone 85% and 40% of anthracnose (*C.gloeosporioides*)were recorded on Avocadorespectively. In addition at Maytser and Baytemalkebeles of South Ari woreda 77% *and* 32.5% of powdery mildew(*Odium spp.*)were recorded as the highest mean infection on Avocado and Mango, respectively (Tabel 2).

The mean infection Orange ranged from 12.5% (*Phytophthoraspp*.)to 30.25% (*Acrosporiumtingitanium)* in Baytsemalkebele (Tabe2).The previous studiesreported that Mango, Avocado, Papaya and Orange are affected by different diseases.

4. Conclusion and Recommendation

Even though the yield loss caused by each pathogen is not clearly studied and quantified in the studied fruit crops , this study indicate the presence of complex diseases at different growth stage of the studied fruit crops. In this studyMango, Avocado and Papaya were attached by five, three and fourdisease causing pathogens respectively.but the number of major pathogens which attacks orange were two across kebeles. Among all diseases fungal diseases (Powdery mildew,Dieback and Anthracnose) are the most frequently encountered diseases in survey area. Efforts should be made towards the integration of multiple control options. These are development of resistance varieties, development of improved agronomic practices, awareness creation of farmers and experts from site selection to post-harvest handling on the importance of diseases and their management. In general holistic, cumulative integrated approach is required in all urgency to manage the complex diseases in the studied areas.

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