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Farmers' perception on falcata (falcataria moluccana (miq.) Barneby & j.w.grimes) gall rust disease in kiorao, kibawe, Bukidnon, Philippines

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Abstract

A survey was conducted to determine the perception of farmers on gall rust of falcata. Gall rust is a common foliage disease of Falcataria moluccana (Miq.) Barneby & J.W. Grimes caused by fungus Uromycladium falcatarium Doungsa-ard, mc Taggart & R.G. Shivas. The study was conducted in Barangay (village) Kiorao, Kibawe, Bukidnon. Survey data showed that the farmer respondents' age is between 25-61 years with different levels of educational background and family size. Respondents' falcata plantations range from 0.2 to 1 hectare in size. Based on the interview, Farmers gained information about gall rust disease mostly from extension programs of government agencies. Only half of the respondents believed that gall rust is caused by fungi while most perceived it is caused by environmental factors. The respondents "strongly agree" that gall rust disease has a negative impact on Falcata trees. Disease management has not been thoroughly practiced by local farmers to control gall rust disease because of limited access to quality resistant seeds and minimal knowledge on the control measures against gall rust disease of Falcata.

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Introduction

Falcataria mollucana (Miq.) Barneby & J. W. Grimes, Fabaceae (Mimosoideae), locally known as falcata, is one of the essential fast-growing tree species found in upland farms in Mindanao, Philippines (Santos *et al*., 2010). Tree farming in the Philippines has become an alternative income-generating activity among farmers, F. mollucana species have grown to supply the massive demand in the local and international wood and paper industries (Dacanay, 2018). It has been cultivated in the Philippines since 1970 for pulp and paper (FMB, 2009), making it a significant dollar earner as a log export in the Philippines (Anino, 2000). In 1988, a devastating gall rust disease was first documented in the country (Anino, 1991). Occurrence and severity of the disease are found to significantly increase in elevation 400m asl and above (Lacandula *et al*, 2017), spacing and age were found to be significant conditions that increase or decrease gall rust incidence (Palma *et al*, 2020). The disease has yet to be controlled hence efforts to determine suitable sites for falcata using GIS software were explored (Paquit and Rojo, 2018).

Although it is known that falcata is susceptible to gall rust disease, farmers and government agencies are still planting this species. This prompted the researcher to investigate the perceptions of local tree growers. According to (Urquhart *et al*., 2017), local perceptions and attitudes toward tree diseases are crucial to assess the threats of the growing incidence of disease outbreaks and apply appropriate disease management control. This study also assessed the effectiveness of the forestry extension conducted by various government agencies including state universities regarding plantation establishment, care, and maintenance. The result of this study will serve as the basis for future forestry extension programs regarding tree diseases.

Material and methods

Research Design

The study was conducted in Barangay Kiorao, Kibawe, Bukidnon. This study employed a descriptive survey research design. The data were collected qualitatively, but analyzed quantitatively, using frequencies, percentages, averages, or other statistical analyses to determine relationships (Hossein, 2015). Also, this design involved a rich collection of data to gain a deeper understanding of individual participants, including their opinions, perspectives, and attitudes (Gall *et al*., 2007).

Participants of the Study

The research respondents were purposely selected from local falcata growers of Barangay Kiorao, Kibawe, Bukidnon. A total of twenty-eight (28) respondents who were participants of the ongoing extension project of the College of the Forestry and Environmental Science, Central Mindanao University were interviewed. According to Guest *et al*., (2016), six to twelve interviews were enough to achieve the desired research objective.

Research Instrument

The research instrument that was used is the self-made survey questionnaire for quantitative and for qualitative analysis. The questionnaire consisted of parts A and B. Part A contained demographic information of the research participants, while part B contained eleven (11) items questions.

The questions were all about the familiarity of gall rust disease, observation of gall formation, causes and factors that increase its probable incidence, the source of information, and control measures concerning gall rust disease on Falcata species. Also, the Likert scale tool was used to measure the attitudes and perceptions concerning potential risks and impacts and appropriate management actions in controlling falcata gall rust disease in the area.

Data Analysis

The data gathered were analyzed descriptively using mean, frequency and percentage. Ordinal logistic regression modeling was employed to identify the variables likely to influence the perception of tree farmers regarding the potential risks and impacts of gall rust disease on falcata plantations.

Results and discussion

Socio-Demographic Profile of the Respondents

Age

The farmer respondents who are in the age group of 41 to 60 years old constitute (57%) while the middle-aged is (29%) ranging from 25 to 40 years old respectively (Fig. 1). On the other hand, a minimal percentage of 14% of the Falcata farmers are between 61 years old and above. This inferred that most of the respondents are still within active age for tree farming production. Half of the respondents are aged between 41-60 years old, the peak of the productive years.

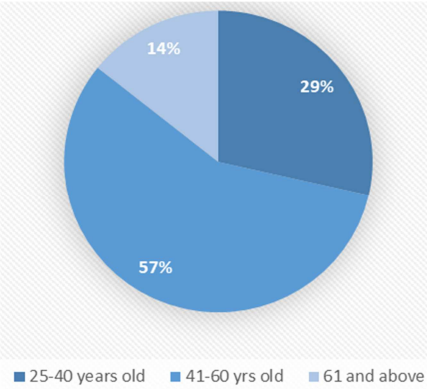

Fig. 1. Age group of the farmer respondents from Barangay Kiorao, Kibawe Bukidnon.

Level of Education

Education enhances the farming skills and productive capabilities of the farmers (Weir, 1999). It is essential in acquiring knowledge and access to additional information. Generally, the respondents were educated in this study, as shown in Fig. 2, there were 54% of the Falcata farmers obtained high school education, while 29% and 18% attained elementary and college levels respectively.

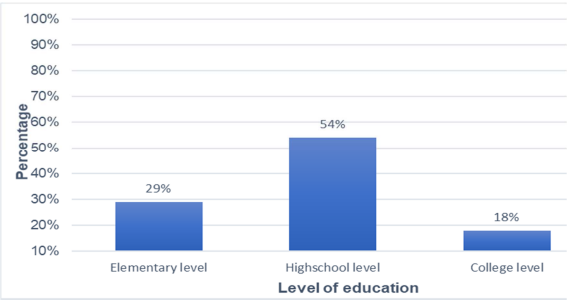

Fig. 2. Educational attainment of farmer respondents from Barangay Kiorao, Kibawe Bukidnon.

Family Size

The farmer respondents have a range of 5-8 children (54%) while others have 1-4 children (46%) in every household as shown in Fig. 3. The number of children means the number of dependents in the household. The result is similar to the findings of Palis (2020), where the average household size of farmers was five and the average number of children was four.

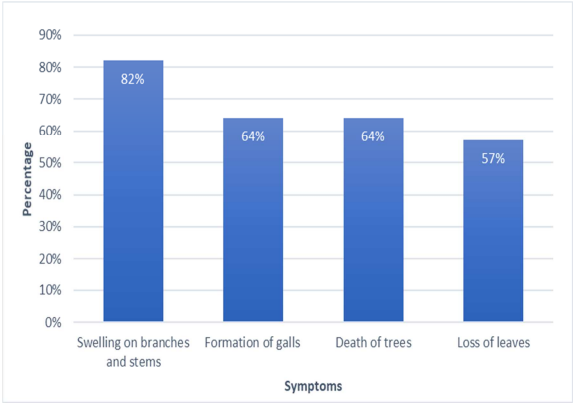

Fig. 3. Perception of farmer respondents regarding symptoms of gall rust disease.

Size of the Farm

Most of the Falcata farmers (82%) in the study site have an area ranging from 0.2-1 hectares while 14% of the farmers have 1.1-2.17 ha and only 4% have 3-4 hectares. This means that majority of the respondents are small scale farmers with less than a hectare of Falcata plantation.

Perception of Farmers on the cause of Gall rust disease and its symptoms

All the falcata farmer respondents were familiar with gall rust occurrence on their falcata trees. Most of them (82%) have gained information about this gall rust disease on extension projects and programs held in their community. Some farmers have heard about the disease from the local government (43%), community leaders (18%), and Radio and TV (7% and 4%). However, only 50% of the farmers believed that the disease is caused by fungi. Thus, there is an obvious information gap. Therefore, extension activities must be recalibrated to ensure information is absorbed by the farmers. Farmers' access to this information is crucial to their success and failure (Botlhoko and Oladele, 2013).

When the Falcata farmers were asked about the symptoms of gall rust disease, the majority (82%) (Fig. 3) believed the swelling of stem and branches is the symptom, while 62% in the formation of galls and only 57% believed in loss of leaves.

The farmers (68%) also believed that symptoms of gall rust occurred on the stems and branches at the same time only 11% believed that it will occur on shoots. The visible symptom of gall rust includes the formation of chocolate brown, cauliflower, or whip-like galls on its stem, branches, petioles, leaves, and pods (Rahayu *et al.*, 2010). Further, in the nurseries, the infected seedlings usually lost their leaves and became stunted, and were eventually killed with a mortality rate of around 90-100% (De Guzman *et al.*, 1991).

On the factors affecting gall rust occurrence, the study of Lacandula *et al.* (2017) and Rahayu *et al.* (2018) revealed that elevation, humidity, wind speed, and fog are related to gall rust incidence. The farmers in the study site were then assessed for their awareness regarding the said factors. Interview revealed that Farmers believed that wind speed (57%), foggy condition (50%), high relative humidity (39%), and high elevation areas (36%) are the contributing factors to gall rust occurrence on Falcata trees (Fig. 4). This shows that information received by the farmers was somehow lacking.

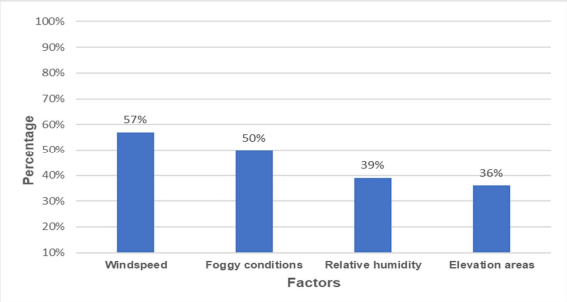

Fig. 4. Perception of farmer respondents regarding factors affecting gall rust of falcate.

Basic information such as symptoms of disease and the causal agents is necessary for successful disease management. Although they were beneficiaries of forestry extension and other government projects but based on the result of the survey as discussed above, it is clear that the falcata farmers in the study site have a different view specifically on the cause and symptoms of gall rust disease. There is a need to investigate or find suitable techniques for conducting information dissemination or extension programs in which farmers can fully understand or absorbed the information. Kiros-Meles and Abang (2008) argued that differences in perceptions and knowledge of crop diseases constitute a major obstacle in farmer–researcher cooperation, which is necessary for sustainable disease management. Yemataw *et al.* (2016), stressed that awareness and community mobilization is important in successfully controlling plant disease.

Perception of farmers regarding impacts of gall rust in Falcata Plantation

Gall rust can infect all growth stages of falcata (Rahayu *et al*, 2010). The disease can cause severe deformation in tree form thereby reducing quality and resulting in a significant reduction in the value of timber (Lacandula *et al.*, 2017) and in some cases death (Old and Cristovao 2003). The awareness of farmers regarding the impacts of the disease on their plantations was then assessed.

As shown in table 1, a total mean of 4.40 signifies that most of the Falcata farmers believed that gall rust disease has potential risks and impacts on the falcata plantation. Most farmer respondents “strongly agree” that gall rust disease impact falcata trees were lower wood quality, reduces the price of timber, death of trees, causes serious damage to seedlings and saplings, lower timber production, and slow growth.

Ordinal logistic regression was run to determine the effect of age and level of education on the awareness of farmers of the impacts of gall rust disease on their plantations as enumerated above. The final model was not statistically significant suggesting that age and level of education did not influence the awareness of the farmers specifically on the potential impacts of gall rust disease on their falcata plantation. It can be deduced that all potential impacts were somehow experienced by farmers.

Table 1. Perception of farmer respondents regarding Potential risks and impacts of gall rust occurrence in Falcata tree species.

Statements	Rating	Description
Lower wood quality	4.42	Strongly agree
Reduces the price of timber	4.39	Strongly agree
Death on trees	4.36	Strongly agree
Causes serious damage to seedlings and saplings	4.39	Strongly agree
Additional cost in dealing with infected trees	4.18	Agree
Lower timber production	4.64	Strongly agree
Slow growth	4.39	Strongly agree
Mean	4.40	Strongly agree

Legend: 1.00-1.80Strongly disagree1.90-2.60 Disagree2.70-3.40Neutral 3.50-4.20Agree4.30-5.00strongly agree

Control measures applied by farmers

Falcata farmer respondents (68%) did not apply any control measures in regulating gall rust disease observed in their falcata plantations. While the other farmers (32%) applied minimal control and preventive measures in the management of Falcata gall rust. For that 32% who have applied control measures, a multiple answer questionnaire was administered. The result showed (Table 2), that only 32% used healthy and uninfected seeds while only 11% are familiar with mother tree selection. For seedling management, only 25% of the respondents conducts regular monitoring, and only 25% used chemical control. Burning of plant parts which are recommended in Lacandula *et al.* (2017), is only practiced by 18% of the participants.

Table 2. Farmer respondents' practices against Falcata gall rust disease.

	Frequency	Percentage
FOR SEEDS		
Used healthy and uninfected seeds	9	32%
Used selected material from resistant and or moderately resistant seed sources	3	11%
FOR SEEDLINGS		
Early detection	5	18%
Regular monitoring	7	25%
Reducing the high humidity in the nursery	2	7%
Chemical control (use of fungicides)	7	25%
For young and mature trees		
Pruning	7	25%
Thinning	3	11%
Burning of Plant Parts	5	18%

This survey result shows that only a few of the farmers practiced control measures to atleast minimize the spread of disease. This can be attributed to a lack of information dissemination by government agencies and research institutes. Their lack of awareness of control practices may lead to the further spread of the disease. Although the disease is prevalent, government agencies still are providing falcata seedlings, especially in NGP projects (DENR, 2014). The government agency which is primarily responsible for the tree plantation projects should only recommend falcata species to areas with less probability of severe gall rust occurrence.

Conclusion

The survey result shows that the Falcata farmers in kiorao, Kibawe Bukidnon have varied perceptions regarding the cause and symptoms of gall rust disease. However, most farmers strongly agree that gall rust disease can negatively affect their Falcata trees. Even though the disease is prevalent, only a few farmers practiced control measures to at least minimize the severity and spread of gall rust disease.

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Reference

Anino E. 1991. Control of rust disease of falcata (*Parasirianthes falcataria* (L.) Forsberg) in Paper Industries Corporation of the Philippines. Philippine Lumberman **37.**

Anino E. 2000. Commercial plantation establishment, management and wood utilization of *Paraserianthes falcataria* (Nielsen); In the Caraga Region: A handbook. Extension book series no. 1. 2000. Northern Mindanao State Institute of Science and Technology, Butuan City p. 7.

Botlhoko GJ, Oladele OI. 2013. Factors affecting farmers participation in agricultural Projects in Ngaka Modiri Molema district north west province, South Africa. Journal of Human Ecology **41(3),** 201-206. https://doi.org/10.1080/09709274.2013.11906568

Dacanay LR. 2018. "A Tree Story: Narratives of *Paraserianthes Falcataria* L. Nielsen (Falcata) Farmers." Open Science Journal 3.3.
DOI: https://doi.org/10.23954/osj.v3i3.1456

De Guzman ED, Militante EP, Lucero R. 1991 Forest nursery diseases and insects in the Philippines. In Sutherland JR. Glover SD EDS proceedings of the First Meeting of IUFRO working party. Victoria, British Columbia, Canada. Forestry Canada, Pacific Forestry Center, Information Report BC-X- **331,** 101-10.

DENR. 2014. Department of Environment and Natural Resources National Greening Program. http://www.ngp.denr.gov.ph/index.php/site-administrator/ngp-accomplishment-report. Accessed 3 June 3, 2022

Gall M, Gall J, Borg R. 2007. Educational research: An introduction (8th Ed.). New York, NY: Pearson Education.

Kiros-Meles A, Abangmm. 2008. Farmers' knowledge of crop diseases and control strategies in the Regional State of Tigrai, northern Ethiopia: implications for farmer-researcher collaboration in disease management. Agriculture and Human Values **25(3),** 433-452. DOI: 10.1007/s10460-007-9109-6

Lacandula L, Rojo MJ, Casas J, Puno, GR. 2017. Geospatial analysis on the influence of biophysical factors on the gall rust prevalence in falcata (*Paraserianthes falcataria* L. Nielsen) plantation in Gingoog city, Philippines.

Nassaji H. 2015. Qualitative and descriptive research: Data type versus data analysis. Language teaching research **19(2),** 129-132.

Old KM, Cristovao CDS. 2003. A rust epidemic of the coffee shade tree (*Paraserianthes falcataria*) in East Timor. Agriculture: New Directions for a New Nation East Timor (Timor-Leste). Australian Centre for International Agricultural Research Proceedings **113.**

Palis F. 2020. Aging Filipino rice farmers and their aspirations for their children. Philippine Journal of Science **149(2),** 351-361.

Palma RA, Tiongco LE, Canencia OP, Boniao RD, Florida EJ, & Dagonio JY. 2020. February). Gall rust disease incidence of Falcata (*Paraserianthes falcataria* (L.) Nielsen) in Falcata based agroforestry systems in Misamis Oriental, Philippines. In IOP Conference Series: Earth and Environmental Science (Vol. **449,** No. 1, p. 012035).

Paquit J, Rojo MJ. 2018. Assessing suitable sites for falcata (*Paraserianthes falcataria* Nielsen) plantation in Bukidnon, Philippines using GIS. International Journal of Biosciences, IJB.

Rahayu S, Lee SS, Shukor NAA, Saleh G. 2018. Environmental factors related to gall rust disease development on *Falcataria moluccana* (Miq.) barneby & JW Grimes at Brumas estate, Tawau, Sabah, Malaysia. Applied Ecology and Environmental Research **16(6),** 7485-7499.

Rahayu S, Lee SS, Shukor NAA. 2010. Uromycladium tepperianum, the gall rust fungus from *Falcataria moluccana* in Malaysia and Indonesia. Mycoscience **51(2),** 149-153. https://doi.org/10.1007/S10267-009-0022-2

Santos MF, Lusiana B, Van NM. 2010. Tree growth prediction in relation to a simple set of site quality indicators for six native tree species in the Philippines. International Journal of Forestry Research 2010. http://dx.doi.org/10.1155/2010/507

Urquhart J, Potter C, Barnett J, Fellenor J, Mumford J, Quine CP, Bayliss H. 2017. Awareness, concern and willingness to adopt bio-secure behaviors: public perceptions of invasive tree pests and pathogens in the UK. Biological Invasions **19(9),** 2567-2582. DOI: 10.1007/s10530-017-1467-4

Weir S. 1999. The effects of education on farmer productivity in rural Ethiopia. Centre for the Study of African Economies Working Paper no. WPS/99–7, Oxford University, Oxford.

Yemataw Z, Zeberga A, Muzemil S, Handoro F, Yeshitla M. 2016. Community mobilization and awareness creation for the management of enset xanthomonas wilt (EXW): the case of Gerino enset Tekil Kebele Administration, Gurage Zone, Southern Ethiopia. American Journal of Plant Sciences **7(13),** 1765-1781. DOI: 10.4236/ajps.2016.713165