KNOWLEDGE, ATTITUDE AND PRACTICE ON WATER HYACINTH (*EICHHORNIA CRASSIPES*) AMONG COMMUNITIES ADJACENT TO RIFT VALLEY LAKES, ETHIOPIA

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ABSTRACT: Water hyacinth (*Eichhornia crassipes*) remains as one of the top notorious invasive species threatening biodiversity, socio-economy, and health in tropics and subtropics of the globe. Public awareness, views and practices are weighty to prevent and manage its invasion. In this survey the knowledge, attitude, and practice of communities adjacent to Rift Valley Lakes were assessed through cross-sectional study design. Data were collected using semi structured questionnaires. The mean knowledge and attitude scores were significantly different by gender, education, and occupation ($\alpha = 5\%$, $P \leq 0.05$). High level (> 50%) of knowledge and attitude were scored by 68.75% and 85% of respondents, respectively. More than half of the respondents scored a low practice level. Those who scored high practice (> 50%) represented 38.70% of the total respondents. Majority of respondents understood the adverse impacts, infestation factors, and some biological natures of water hyacinth. All respondents felt discomfort with the presence of the weed, and they had willingness to participate in cleanup attempts. Overall, this survey showed that most of the adjacent communities had promising baseline knowledge of the weed and positive attitude to prevent its future invasion, but less practice to control its spread. The knowledge and attitude of the local communities has the potential to be translated into good water hyacinth management practices. Thus, the major actors particularly, the Ethiopian Biodiversity Institute, Regional Environment, Forest and Climate Change Authority, Federal and Regional water resource and agriculture related bureaus should act to translate communities' knowledge and attitude into practices.

Keywords: Attitude, Invasive plants, Knowledge, Practice, Rift valley lakes, Water hyacinth.

INTRODUCTION

Water hyacinth [*Eichhornia crassipes* (Mart.) Solms] remains one of the top notorious aquatic weeds in the world posing severe damage on biodiversity, ecosystem functionality, socio-economy, and human health. It originates from the rain forests of the Amazon River, South America and has been introduced to

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other parts of the world in the 19th century (Sharma et al., 2016). To date, its infestation has been reported in over 50 countries of tropical, subtropical and warm temperate regions of the five continents: Southeast Asia, the Southeastern United States, Central and Western Africa, and Central America (Rakotoarisoa et al., 2015; Sharma et al., 2016). In Africa, since the time of its introduction in late of 1800s, it has aggressively colonized vital freshwater bodies and wetlands: particularly in South Africa (Ilo et al., 2020), Zimbabwe (Chapungu et al., 2018), Ghana (Honlah et al., 2019), Nigeria (Ayanda et al., 2020), Kenya (Otieno, 2014), and Ethiopia (Enyew et al., 2020).The weed was officially reported in Ethiopia about 60 years ago in Koka reservoir and Awash River (Stroud, 1994). Thenceforth, it remains problematic taking over wetlands and freshwater bodies of the country: Tana, Abaya, Koka, Koka Dam, Ziway, Ellen, Baro-Akobo River Basin (Sobate, Baro, Gillo and Pibor rivers), and Elltoke (Taye et al., 2009; Mengist and Moges, 2019; Enyew et al., 2020; Yigermal et al., 2020). The infestation is becoming the worst, threatening the country's aquatic ecosystems services and biodiversity including native mammals, birds, fishes, algae and aquatic plants (Mengist and Moges, 2019; Enyew et al., 2020; Hussien et al., 2020).

Humans are a key dimension of biological invasions, acting as drivers for their introduction, experiencing the consequences of their uncontrolled expansion and deciding on the management of those species (Shackleton et al., 2019; Vaz et al., 2020). Social awareness and perceptions are keys for achieving successful management actions, including their control or eradication (Shackleton et al., 2019; Vaz et al., 2020). Certainly, communities' better knowledge and attitude play crucial roles to mitigate the adverse impacts and manage future invasion (Luna et al., 2019). Foremost, understanding public awareness and beliefs becomes a priority action while developing action plans for the strategic management of invasive species (Shackleton and Shackleton 2016; Waliczek et al., 2017). Knowledge, attitude, and practice (KAP) survey represents information on what is known (knowledge), believed (attitude), and done (practiced) in a target population (Andrade et al., 2020). It has become a popular approach to establish quantitative and repeatable measurements of public awareness and actions in the context of a topic of interest (Wittenberg and Cock, 2001; Zahedi et al., 2014). KAP survey provides social baseline information on the general knowledge, attitude and practice (Ford-Thompson, 2012; Caceres-Escobar et al., 2019). The lack of baseline information on public perception affects resource allocation, planning, program implementation, public engagement, and future invasion prevention (Andrade et al., 2020).

Several impact assessments and empirical studies have been reported, and many recurrent attempts have been made to control the infestation of water hyacinth in Ethiopia. The attempts lacked proper knowledge deliveries and communications with the local communities. Prior survey to identify public baseline knowledge, myths, attitude, beliefs, and behaviors in relation to water hyacinth is absent. The management practices were not strategically guided based on KAP analysis. These could be a reason to the failure of previous water hyacinth control efforts in Ethiopia. On the other hand, water hyacinth management can sometimes face challenges often due to perceived socio-political risks, misconceptions in the local communities, and unexpected technical difficulties (Wang et al., 2019). Thus, to halt the adverse impacts of water hyacinth, it is imperative that we advance not only with eradication protocols and strategies, but also with being conscious of communities' awareness, and with the techniques to engage with local communities when eradication plans are undertaken. This survey aimed to evaluate the knowledge, attitude, and practice of local communities adjacent to Rift Valley lakes (Ziway, Ellen, and Qoqa) in Oromia Region, Ethiopia.

METHODS

Description of the study area

This survey was conducted in four districts of Oromia Region: Adami Tullu (7°52′N38°42′E), Bora (8.30°N 38.95°E), Lume (8°20'00.0"N 36°49'00.0"E), and Dodota (8° 14' 60.00" N 39° 19' 60.00" E). The districts were selected from three zones of Oromia Region: East Shewa, Arsi, and West Arsi. Three lakes namely: Koka (altitude 1584 m a.s.l., water body area 177 Km^2), Ellen (altitude 1700 m a.s.l., water body area 28 km^2, mean depth 2.5 m), and Ziway (altitude 1636 m a.s.l., water body area 440 Km^2, mean depth 2.5 m), which are found in the Rift Valley of Ethiopia, were selected for the survey (Figure 1).

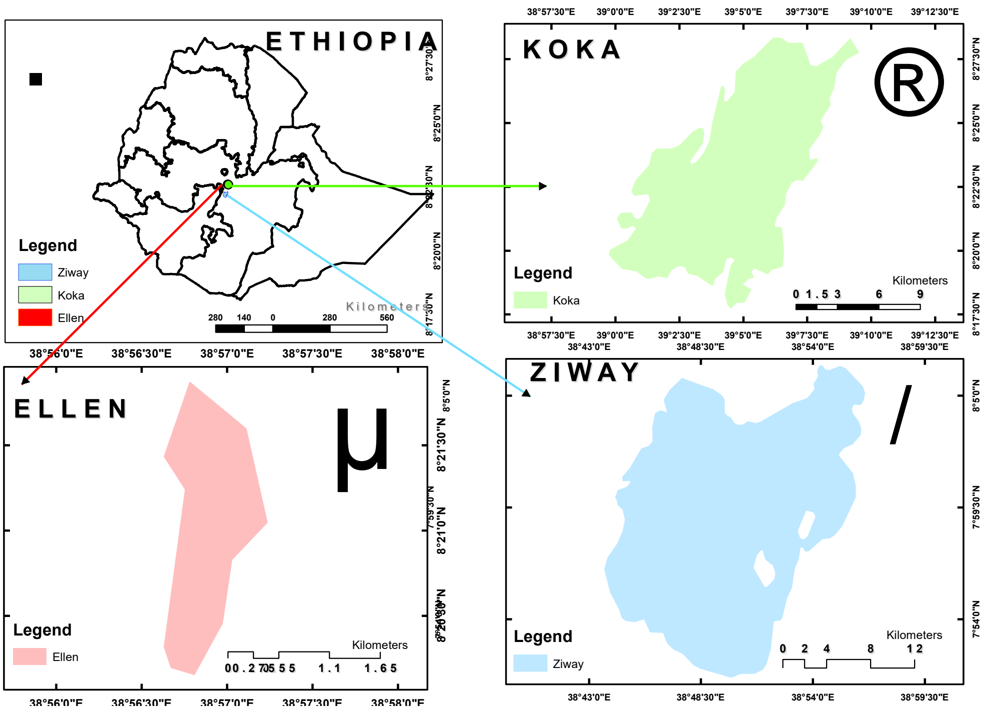

Figure 1. Map of Koka, Ellen and Ziway lakes.

Lake Ziway is one of the largest freshwater bodies found in the Rift Valley. It is located at about 160 Km South of Addis Ababa (7052' to 808'N latitude and 7052' to 38056'E longitude). The lake is situated at an altitude of 1636 m above sea level with a surface area of 434 Km^2 and mean of depth 2.5 m (Gebremedhin and Belliethathan, 2019). Its maximum depth is 9 m with average depth of 2.5 m; the volume is approximately 1.1 billion m^3 (Tamiru, 2019). After the late 1980s, it showed a slight reduction, which is reported to be a result of uncontrolled water abstractions for small-scale irrigation schemes in the upper reaches of the catchments (Tamiru, 2019). Lake Ziway provides 7-8 million cubic meters of water per year for domestic, livestock, and for the municipality of Ziway Town. It also serves as a source of water for open and closed farm irrigation and contributes a huge fish market supply in the country. A large number of local people including women and children depend on the lake for their livelihoods. Along with its economic and livelihood values, the watershed of the lake supports the varieties of biodiversity and unique ecological services (Gebremedhin and Belliethathan, 2019; Tamiru, 2019).

Lake Koka is actually a reservoir created by the Koka Dam, constructed in the late 1950s and opened in 1960 for hydropower, flood control, and irrigation (Kloos and Legesse, 2010). It is located in the Ethiopian Rift Valley (08°23’22” N - 39°05’15” E) at an altitude of 1590 m a.s.l., about 90 km Southeast of Addis Ababa. It has 255 Km^2 area coverage with a maximum and mean depth of 14 m and 9 m, respectively; it has 1191 tons of fishery potential per year (Gashaw and Wolff, 2015; Hussien et al., 2020). The climate is characterized by a four-months dry season (November to February) and an eight-months rainy season (March to October). The total annual rainfall varies from 600-800 mm and the mean annual temperature ranges from 20-26^{o}C. The pH of the water ranges from 8-9 and conductivity from 200-393 µS/cm (Gashaw and Wolff, 2015). The local communities of the lake have utilized the resources as a source of livelihood income. Parts of the landscapes are mainly agricultural lands populated by smallholders. The water of the lake is used for irrigation, bathing, recreation, and drinking water for domestic use and wildlife. The fisheries and tourism of the lake supply vital fish production and income for the local people in the area.

Lake Ellen is located at 08^{o}23’ N longitude, 38^{o}59’ E latitude and at an altitude of 1700 m a.s.l, eight kilometer west of Alem Tena town in Dugda Bora District of Oromia region (Samuel and Nestanet, 2014). It has 28 Km^2 water body area coverage and 2.5 meters mean of depth (Gebregiorgis, 2017), and it is currently expanding to Rift Valley lakes. The lake provides important resources for the livelihood of the local communities such as drinking water, fishing, irrigation, transportation and recreation. In addition to being a key strategic resource for sustaining local people’s livelihood, and promoting economic development; it maintains the varieties of both aquatic and terrestrial biodiversity in the area.

Household selection and data collection

The study zones and districts were selected purposely based on the information obtained from the Environment Forest and Wildlife Protection and Development Authority of Oromia Region considering the degree of infestation of the lakes. The districts were chosen by the Zonal Environment Forest and Wildlife Protection and Development Authority based on the socio-economic values of the lakes and dependency of the adjacent communities on the lakes. Consulting the Wildlife Protection and Development Authority of the districts, 131 fishers and farmers who depended on the lakes for fishing and/or farming were listed, and then 67 males and 13 females were randomly sampled from the list using lottery method. Then, the selected respondents were recruited after obtaining their consent to participate in the study.

The data were collected using semi structured questionnaires. In the process, respondents were asked to explain their views on factors promoting water hyacinth introduction, growth and spread, adverse impact on biodiversity, socio-economy, and health; the beliefs and misconceptions in the population to prevent, control and manage water hyacinth, the adverse impacts on the lakes and aquatic biodiversity; and the practical experiences they had to prevent, control and manage, and the control methods they were using to handle water hyacinth proliferation.

Data analysis

Data were summarized using descriptive statistics and presented by percentages, frequency distribution, tables, and graphs. In order to check for all possible differences among groups, analysis of variance (ANOVA) was used. Comparisons between groups were made using Student's t-test for continuous variables. Data were analyzed using SPSS Statistics for Windows, version 21 (IBM Corp., N.Y., USA), and graphs were built using Excel Microsoft Office 2016.

RESULTS

Demography

The average age of respondents was 41.78 ± 14.23 with minimum19 and maximum 78 years. Ninety-five percent were engaged in either fishing, or farming or both. Five percent were running a small business such as giving transportation services on the lakes and vending fish products. In data analysis, this segment was added to respondents who were engaged in both fishing and farming. Table 1 presents the socio demographic characteristics of respondents.

Table 1. Respondents' demographics characteristics by their district.

Demography		Districts								Total	
		Adami Tullu		Bora		Dodota		Lume			
		N	%	N	%	N	%	N	%	N	%
Gender	Male	12	100	21	63.64	12	100	22	95.65	67	83.75
	Female	0	0	12	36.36	0	0	1	4.35	13	16.25
Age	< 25	0	0	6	18.20	0	0	1	4.35	7	8.75
	25-44	7	58.30	16	48.50	8	66.66	9	39.13	40	50.00
	45-64	5	41.70	10	30.30	2	16.67	10	43.48	27	33.75
	>64	0	0	1	3.00	2	16.67	3	13.04	6	7.50
Education	Illiterate	3	25.00	18	54.55	2	16.67	8	34.78	31	38.75
	Primary	6	50.00	14	42.42	6	50.00	10	43.48	36	45.00
	Secondary+	3	25.00	1	3.03	4	33.33	5	21.74	13	16.25
Occupation	Fishing	12	100	7	21.21	3	25.00	6	26.09	28	35.00
	Farming	0	0	12	36.36	5	41.67	9	39.13	26	32.50
	Fishing & Farming	0	0	14	42.42	4	33.33	8	34.78	26	32.50

Access to information

Seventy-four percent of the respondents claimed that they did not hear any information about water hyacinth from any print or electronic media before. Twenty six percent were informed about the weed either by Regional Media outlets, or Ziway Fisheries Resources Research Center (ZFRRC) or Zonal Environment, Forest and Climate Change Authority (EFCCA) office (Figure 2).

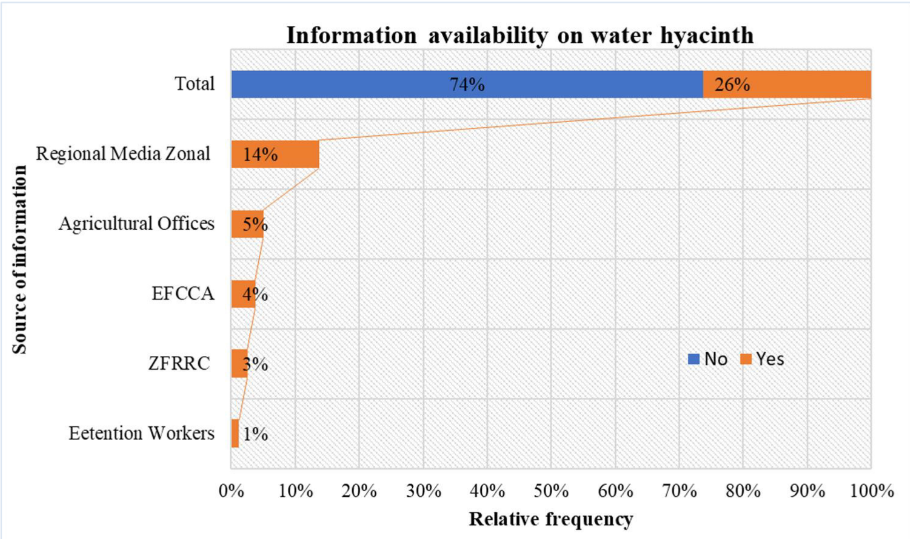

Figure 2. Information sources for respondents on water hyacinth. EFCCA- Environment, Forest and Climate Change Authority, ZFRRC- Ziway Fisheries Resources Research Center.

Date of introduction

The time that the respondents noticed water hyacinth on the lakes ranged between 1962 and 2002 and it shows significant correlation with the age of the respondents ($\alpha = 5\%$, $p = 0.00$). Figure 3 presents the relationships between the age of respondents and the year they noticed water hyacinth on the three lakes.

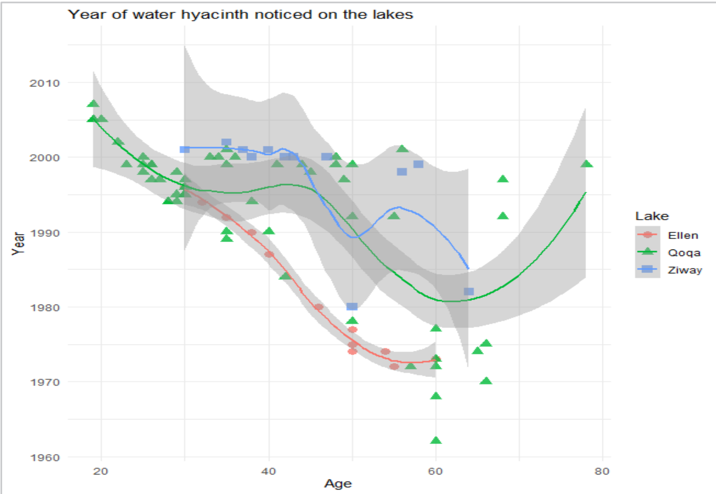

Figure 3. Relationships between age of respondents and the year they noticed water hyacinth on the lakes.

Methods of introduction

Half of the respondents (50%) thought Awash River brought water hyacinths from infested areas and dispersed on the lakes. Others (31%) listed flood, wind, and intentional importation by humans for mulch (Figure 4) while 15 respondents (19%) claimed that they were not sure how water hyacinth was introduced on the lakes.

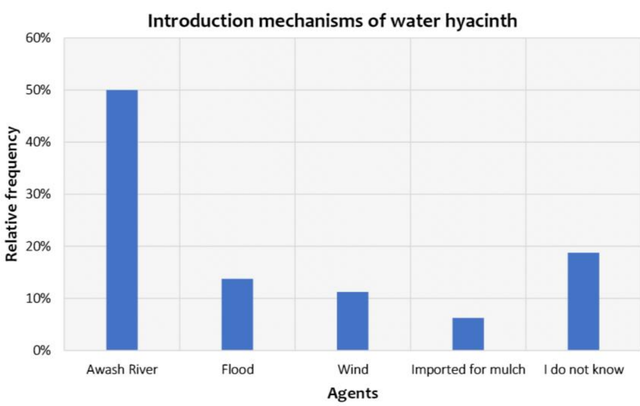

Figure4. Views of respondents on how water hyacinth was introduced into the lakes.

Factors promoting growth and spread

Respondents listed seven major factors that promoted the growth and rapid spread of water hyacinthon the lakes (Figure 5). Flood was the most frequently mentioned factor, followed bythe biological nature of water hyacinth (particularly its rapid reproduction rate) and wind (transporting from infested areas to uninfested areas). Of the total respondents, 30 (37.5%) claimed that agricultural and urban wastes had promoted the rapid infestation and growth of water hyacinth in the past years.

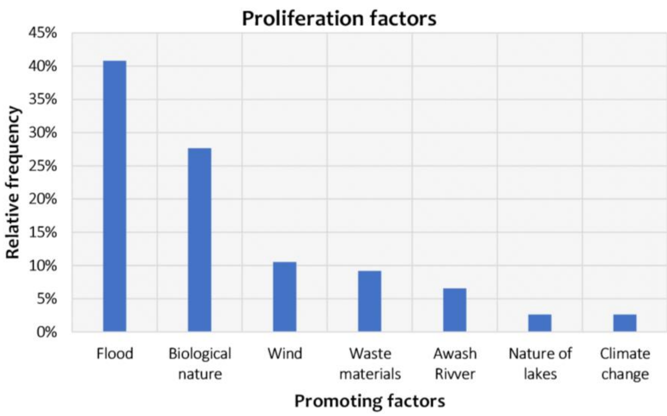

Figure 5. Views of respondents on factors promoting the growth and spread of water hyacinth on the lakes.

Knowledge

The average knowledge score of respondents was 65.64 ± 14.65 and it ranged from 23.08to 92.31.Comparison of the knowledge score of males and females indicated the presence of significant difference (independent samples t-test; t (78) = 3.53, p = 0.001, 95% CI (6.37 – 22.89)). The mean knowledge score of respondents was significantly different by education level (One-Way ANOVA; F(2) = 4.022, P = 0.022). The knowledge score of fishers, farmers, and those who engaged in both fishing and farming significantly varied within groups (One-Way ANOVA; F(2) = 5.772, P = 0.005). Table 2 presents the detailed comparison of knowledge scores by socio demographic characteristics.

Of the survey population, 55 (68.75%) scored high level of knowledge (above 50%). The mean high-level knowledge score was 64.20 ± 10.28. The minimum (53.85) and the maximum (92.31) high-level knowledge scores represented 22.50% and 2.50% of the total sample population, respectively. The mean high-level knowledge scores of fishers, farmers, and respondents who were engaged in fishing and farming were 66.67, 58.97, and 66.80, respectively; and there were statistically significant differences among them. The mean high-level knowledge score of respondents who had information access and who had no information access from any printed or electronic media were 67.52 and 62.58, respectively.

Table 2. Multiple comparisons of knowledge score of respondents by demographic characteristics.

Demography	Category	Mean	Comparison			P – value
			Category-1	Category-2	P – value	
Gender	Male	59.01	-	-	-	0.001
	Female	44.38	-	-	-	
Age[‡]	< 25	52.75	<25	25-44	0.56	0.82
				45-64	0.37	
	25-44	56.35		>64	0.77	
	45-64	58.41	25-44	45-64	0.58	
				>64	0.85	
	>64	55.13	45-64	>64	0.63	
Education	Illiterate	51.37	Illiterate	Primary	.036	0.022
	Primary	58.76		Secondary +	.012	
	Secondary +	63.31	Primary	Secondary +	.322	
Occupation	Fishing	58.58	Fishing	Farming	.029	0.005
	Farming	50.37		Fishing & Farming	.281	
	Fishing & Farming	62.88	Farming	Fishing & Farming	.002	
Work experience	<11	53.52	<11	11-25	.023	0.056
	11-25	62.90		>25	.179	
	>25	59.14	11-25	>25	.452	
Access to information	Yes	63.74	-	-	-	0.009
	No	54.11	-	-	-	

‡ The age group is based on United Nations (1982)

Attitude

The attitude score of respondents was varied with 63.19 mean, 55.56 range, and 13.76 standard deviation. The minimum attitude score was 33.33, and this accounted for 7.50% of the total sample population. The maximum attitude score of the respondents was 88.89 representing 5% of the total sample population. The attitude scores of illiterates, 58.07; primary school, 67.28, and secondary school, 64.10, were significantly different at α = 5% One-way ANOVA test (p = 0.021). The attitude score of fishers, farmers, and those who engaged in both fishing and farming significantly varied within a group α = 5% One-way ANOVA test (p = 0.004). Table 3 shows the comparison of respondents' attitude score by demographic characteristics.

Of the survey population, 85% scored a high level of attitude (above 50%). The mean of high-level attitude score was 67.48 ± 9.66. The minimum high-level attitude score (55.56) accounted for 23.75% of the total sample population. The maximum high-level attitude score (88.89) represented 5% of the total sample population. There was a significant mean difference between male (68.97) and female (58.89) high-level attitude scores (independent samples t-test; t(66) = 3.26, p = 0.002, 95% CI (3.90 – 16.25)). The mean high-level attitude score of respondents who had access to information and who had no access to information on water hyacinth were 68.89 and 66.90 respectively, with non-significant difference.

Table 3. Multiple comparisons of attitude score of respondents by demographic characteristics.

Demography	Category	Mean	Comparison			P – value
			Category-1	Category-2	P – value	
Gender	Male	64.84	-	-	-	0.014
	Female	54.70	-	-	-	
Age	< 25	60.32	<25	25-44	0.53	0.82
				45-64	0.56	
	25-44	63.89		>64	0.89	
	45-64	63.79	25-44	45-64	0.98	
				>64	0.45	
	>64	59.26	45-64	>64	0.47	
Education	Illiterate	58.07	Illiterate	Primary	.006	0.021
	Primary	67.28		Secondary +	.172	
	Secondary +	64.10	Primary	Secondary +	.461	
Occupation	Fishing	64.53	Fishing	Farming	.040	0.004
	Farming	57.35		Fishing & Farming	.178	
	Fishing & Farming	69.57	Farming	Fishing & Farming	.001	
Work experience	<11	61.47	<11	11-25	.097	0.25
	11-25	67.97		>25	.664	
	>25	63.19	11-25	>25	.319	
Access to information	Yes	67.73	-	-	-	0.079
	No	61.58	-	-	-	

Practice

The mean practice score of the survey population was 50 ± 17.34. The minimum was 33.33, and this accounted for 61.30% of the total sample population. The maximum practice score was 66.67 representing 38.70% of the total sample population. Of the survey population, only 38.70% of respondents scored a high level of practice (above 50%). Table 4 shows the comparison of respondents' practice score by demographic characteristics.

Table 4. Multiple comparisons of practice score of respondents by demographic characteristics.

Demography	Category	Mean	Comparison			P – value
			Category-1	Category-2	P – value	
Gender	Male	51.49	-	-	-	0.080
	Female	42.31	-	-	-	
Age	< 25	42.86	< 25	25-44	0.58	0.49
				45-64	0.35	
	25-44	46.67		>64	0.67	
	45-64	49.38	25-44	45-64	0.51	
				>64	0.29	
	>64	38.89	45-64	>64	0.16	
Education	Illiterate	49.19	Illiterate	Primary	.728	0.941
	Primary	50.69		Secondary +	.890	
	Secondary +	50.00	Primary	Secondary +	.903	
Occupation	Fishing	54.81	Fishing	Farming	.165	0.216
	Farming	48.39		Fishing & Farming	.106	
	Fishing & Farming	46.74	Farming	Fishing & Farming	.729	
Work experience	<11	48.40	<11	11-25	.361	0.607
	11-25	52.94		>25	.534	
	>25	51.56	11-25	>25	.821	
Access to information	Yes	50.42	-	-	-	0.717
	No	48.81	-	-	-	

DISCUSSION

The results in this survey showed that the local communities, farmers and fishers, in particular those adjacent to the Rift Valley lakes Ziway, Ellen, and Qoqa had basic understanding of water hyacinth's adverse impacts, infestation factors, and some of its biological natures. The results also demonstrated that the local communities felt discomfort with the presence of water hyacinth on the lakes, and they had willingness to participate in any future cleanup attempts.

Awash River, flood, wind, and importation for mulch were listed by respondents as agents that introduced water hyacinth on the lakes. The response to our questionnaires showed that significant respondents thought Awash River brought water hyacinth from Aba Samuel Dam in the 20th century and then disseminated on local lakes via flood and wind. Equivalent evidence was also reported that water hyacinth first appeared in Koka reservoir and disseminated to other parts of the country (Stroud, 1994; Gaikwad and Gavande, 2017; Dersseh et al., 2019). A report by Stroud (1994) highlighted that water hyacinth was introduced to Koka dam and Awash River about half a century ago, and then it was transported to other parts of the country. As per the respondents, the rapid growth and spread have been extensively promoted by factors such as flood, biological nature of the weed, wind, waste materials, Awash River, and climate change. Notably, 30 (37.5%) of the respondents contended that agricultural and urban effluents were massively responsible for promoting the spread of the weed on the lakes. These observations were also reported in other studies which highlighted eutrophication as the main cause of water hyacinth proliferation on Aba Samuel Dam (Taye et al., 2009; Ingwani et al., 2010; Ebro et al., 2017); and Akaki River was the major cause for the Aba Samuel Dam's eutrophication. Since the time of its introduction, as argued by respondents, water hyacinth infestation has been increasing every year posing damaging impacts on socio-economic activities and livelihoods of the local communities (Enyew et al., 2020; Yigermal et al., 2020). Overall, the extent of communities' knowledge and attitude could help to develop comprehensive prevention, control, and management mechanisms to prevail over the infestation problems.

Apart from the promising communities' knowledge and attitude to water hyacinth, socio demographic factors determined the knowledge and attitude scores among individuals. For instance, the availability of information on water hyacinth from any print or electronic media, the types of socio-economic activities that depended on the lakes and educational background had sensible linkage with the knowledge and attitude scores of the respondents. The differences in social awareness and views on water hyacinth have a potential to complicate management actions or can lead to inefficient control efforts (Shackleton et al., 2019). Thus, considering the effects of social structures on public knowledge and information attainments, the gap should be addressed either through training or media delivery systems (Peng et al., 2019). Fishers had better awareness about the socio-economic, environmental, and health impacts of water hyacinth than farmers who withdraw water from the lakes for irrigation. This variation could be related to the time they spend on the lakes for fishing and being more familiar with the weed on their way. It was especially noted that respondents had a clear knowledge constraint to fairly list possible methods to control water hyacinth. For example, none of the respondents mentioned water hyacinth control methods other than manual approach (uprooting), and nobody was conscious about the economic potential of the weed through biomass utilization (Wang et al., 2019), or using it in small-scale cottage industries (e.g., producing goods for domestic uses) which does not require huge investment (Fawad and Jamal, 2019). This finding is useful as it can be used for community-based learning of water hyacinth control methods to address the limitations. In addition, communities' responsiveness should be scaled up through training to be successful in prevention, control, and management measures (Lindemann-Matthies, 2016).

The practice score of respondents was much lower than their knowledge and attitude scores. The majority of the respondents (61.30%), achieved below average practice score (33.33). Perhaps, the communities were not clearly aware of what kind of measures should be taken to prevent or control water hyacinth from their local areas. For instance, from the total respondent who had information on water hyacinth from any print or electronic media, 71% achieved the highest practice score, which represented 46.88% of the total high practice scorers. Their knowledge (66.16) and attitude (69.63) scores were higher than the mean score of the remaining respondents 54.44 and 61.71, respectively. Taking these together, it is clear that educating the communities about the weed not only equip them with basic knowledge, but also guide them to take appropriate actions against the damaging impacts of water hyacinth on biodiversity and ecosystem. A similar survey conducted in Kenya reported that lack of access to information on water hyacinth control mechanisms was associated with the reason why Kenyans were not swiftly taking measures to control water hyacinth whenever it invades water bodies (Mironga, 2014). Equally, respondents' low practice score might be attributed to lack of appropriate organization to mobilize and engage them for action, lack of equipment to clean it up, expecting governmental intervention, and believing that the infestation is beyond their control. These views were frequently reflected and noted throughout the data collection session. Therefore, addressing the gaps, engaging and mobilizing the communities could help to curb water hyacinth spread (Alison and Kirsty, 2007; Ingwani, et al., 2010; Vaz et al., 2020).

To conclude, water hyacinth has remained problematic colonizing the wetlands and freshwater bodies of Ethiopia. Public awareness and perceptions are weighty to prevent and manage the invasion of water hyacinth. The purpose of this survey was to evaluate the knowledge, attitude, and practice of the local communities adjacent to Rift Valley lakes namely Ziway, Ellen, and Qoqa. The local communities (farmers and fishers in particular) had promising knowledge and attitudes on water hyacinth. They had basic understanding about the adverse impacts and its invasion catalysts, felt discomfort with the weed's presence on the lakes, and had willingness to participate in future cleanup attempts. However, socio demographic factors moderately determined communities' knowledge and attitude scores, and the practice scores to prevent and control water hyacinth infestation was very low. This survey is the first KAP study on water hyacinth in Ethiopia, and it can provide baseline information for further studies.

The knowledge and attitude of the local communities has the potential to be translated into better water hyacinth management practices. Therefore, the major actors in biodiversity and ecosystem services, agriculture, and water resources management related activities particularly the Ethiopian Biodiversity Institute, Federal Environment, Forest and Climate Change Commission, Federal and Regional Water, Irrigation and Energy Offices and Agricultural Bureaus should act accordingly to halt the problems caused by water hyacinth.

ACKNOWLEDGEMENT

We gratefully acknowledge all those who helped us in many ways to accomplish data collection and analysis successfully.

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