

Traditional uses of *Corchorus olitorius* L in Oyam District, Northern Uganda: A cross-sectional ethnobotanical survey

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Abstract

Background: *Corchorus olitorius L* is a naturally growing green leafy vegetable used for various medicinal purposes worldwide. Several studies conducted elsewhere indicate that the plant is used for treating cardiac insufficiency, infertility, wounds, malaria, typhoid fever, female and ulcers. However, in Uganda most studies that define medicinal plants do not reveal *Corchorus olitorius L* as being one of them. As a result, there is dearth of documented information regarding its medicinal benefits in the country. In order to bridge this gap, we conducted a study to establish the traditional medicinal uses of *Corchorus olitorius L* in Oyam District, Northern Uganda.

Methods: We employed an ethnobotanical survey using quantitative approach of data collection and analysis. We randomly sampled 246 participants from 40 villages and four sub counties from Oyam district. Data was collected using an interviewer-administered semi-structured questionnaire and analyzed for descriptive statistics using SPSS v20 software.

Results: We collected a total of 239 valid questionnaires giving a response rate of 97 %. The study found out that 231 (96.7%) of the participants ate *Corchorus olitorius L* whereas 185 (77.4%) used it for medicinal purposes. Interestingly, they used it mainly for treatment of joint difficulties (58.12%) and gastrointestinal disturbances (31.19%).

Conclusion: *Corchorus olitorius L* is predominantly used as a medicinal plant for the treatment of joint and gastrointestinal complications.

Background

Globally, an estimated 25-50% of drugs prescribed are derived from plants (1) of which 80% have their uses related to their original ethnopharmacological purposes (2). Traditional knowledge of plant uses provides a criterion for the pharmaceutical industry to develop the plants (materials) into products (3, 4). Unfortunately, there is poor documentation of the traditional medicinal uses of most of these plants as it is often secretly verbally passed on from one generation to another (5, 6). This leads to high risk of loss of knowledge about plants with medicinal values.

Corchorus olitorius L (also commonly known as Jute mallow and locally referred to as *Otigo nino* by the *Langi people of Northern Uganda*), is one of the green leafy vegetables used as traditional medicinal plant in different parts of the world. It belongs to the genus *Corchorus*, the family of *tiliceae*. The genus *Corchorus* comprises an uncertain number of species, with estimates ranging from 40–100. The genus *Corchorus* probably originated from Africa, with a secondary center of diversity in the Indo-Burmese region. *Corchorus olitorius L* (*C. olitorius*) is widespread over tropical Africa and is also found in Nepal, Pakistan, India and Northern Australia. In Africa it occurs from Senegal in the west, east to Somalia and south to South Africa (7). *C. olitorius* seems closest to *Corchorus aestuans*, but this particular species has winged fruits (7). *C. olitorius* has alternate, simple, lanceolate, finely serrated leaves and small (2–3 cm diameter) yellow flowers with five petals plus a multi-seeded fruit capsule (7). It can be easily identified

by the 3 small horns at the top of the slender capsules, which split at maturity with 3 valves. *C. olitorius* is propagated by seed (8), although it is occasionally tolerated as a wild vegetable in crop fields with selective weeding, or grown in home gardens. It grows rapidly in the rainy season with flowering occurring continuously about 6 weeks after germination and seeds maturing at 90–110 days from the time of sowing and can be found throughout the year (8). *C. olitorius* is normally found in savanna, woodland and scrub vegetation, and often grows as a weed. It can be found up to 1700 meter altitude, but is generally grown below 700 meters. In the lowland African tropics, the plant is collected throughout the year. Although it thrives best during the rainy season, it is a drought resistant plant. It can persist up to a month without rainfall, but irrigation improves its growth rate and yields. It also tolerates a high level of rainfall but is very sensitive to excessive water when young. Favorable temperatures range from 22–35°C and diurnal variations within this bracket encourage leaf development. *C. olitorius* can be grown in a range of soil types but well-drained, alluvial or sandy loams are preferable. A soil pH of 6.5–7 is favorable, but it tolerates a pH range of 5.5–8.5 (7, 8). About 40 days after sowing, when the plants have made adequate foliage, harvesting is done every fortnight by topping the leafy shoots. Topping encourages branching and hence gives a higher yield. As flowering occurs concurrently with new leaf formation, flowers of leafy shoots are removed. Fruits become brown when mature and are harvested before shattering the seeds; they are threshed and winnowed to obtain seeds for sowing (7, 8). *C. olitorius* is used as a traditional medicine among various communities (7) for the treatment of: malaria, typhoid fever, female fertility, heart failure, ulcers (7), cold and tumours (9). The plant is also reported to be a demulcent, deobstruent, diuretic, lactagogue, purgative, and tonic (9).

A number of ethnobotanical studies have been conducted in Uganda to define medicinal plants but they do not reveal *C. olitorius* (10-14). Examples include: a study conducted in 2007 by Okello and Ssegawa in Ngai and Apac (15) and another by Kamatenesi conducted in 2011 in Oyam district, (16) both of which were carried out in Northern Uganda. These studies focused on plants with medicinal uses but *C. olitorius* was never mentioned. The only study during which *C. olitorius* was mentioned as a medicinal plant for treating muscle spasms was conducted by Tabuti and others in Bulamogi (Eastern Uganda) (17). However, this study did not specifically focus on *C. olitorius*. Due to the fact that most of the ethnobotanical studies conducted in the region and Uganda remain silent on *C. olitorius* as a medicinal plant, there is limited documentation of its traditional medicinal uses in the country.

We therefore conducted an ethnobotanical survey to investigate the traditional medicinal uses of *C. olitorius* among selected community members of Oyam district, Northern Uganda. Specifically, the study set out to establish: the medicinal use (s), the plant part (s) used, the mode of preparation, the route of administration and the dosage.

Methods

In this study, we set out to describe the traditional medicinal uses of *C. olitorius* by communities of Oyam district in Northern Uganda. Findings from the study reveal that the plant is a highly consumed vegetable as well as a medicine. The main traditional medicinal uses of *C. Olitorius* we identified were related to the

musculoskeletal disorders (63.78%) and gastrointestinal abnormalities (34.05%). These medicinal uses included: joints pain and stiffness; bone pain and weakness; muscular rigidity; gastric ulcers, obstruction and constipation (Table 1). The study participants reported using leaves for medicinal uses. They boiled and ate the leaves as food on a regular basis.

The use of *C. olitorius* for joint and bone pains could probably be attributed to the fact that the plant is rich in calcium which favors bone mineralization thus strength. This in turn prevents fractures coupled to enhancing fracture healing (24). *C. olitorius* use in the treatment of joint pains could as well be explained by its antioxidant activity. Antioxidants are recognized for their ability to activate differentiation of osteoblasts, enhance bone mineralization and reduce osteoclast activity (25, 26). The relief of joint and bone pains as well as menstrual pains could be attributed to the anti-inflammatory effects of *C. olitorius*. Owoyele and others in their study described the anti-inflammatory effects of *C. olitorius* to be due to its phytochemical constituents that have the potential to reduce the level of inflammatory mediators (27). According to a study conducted in Zimbabwe, *C. olitorius* is used for backaches (28). This is in agreement with the findings of the current study as the study participants reported using the plant for body aches and muscular rigidity. It is also supported by the findings of Tabuti and others who reported that *C. olitorius* is used for treating muscle spasms (17). This too could be attributed to the anti-inflammatory properties of *C. olitorius* (27). Interestingly, the uses of *C. olitorius* in the current study (treating joint pain and stiffness) were partly contrary to its uses in other places for example Benin where the plant is mostly used for cardiovascular and gastrointestinal ailments as well as fever, malaria and female infertility (29). Perhaps Ugandan natives have not been keen enough to observe the effect of *C. olitorius* in these conditions. A study in Bangladesh reported *C. olitorius* to be rich in beta carotene, iron, calcium and vitamins A, C and E (9). This discovery supports the findings of the current study where the participants reported that they used *C. olitorius* for improving vision, appetite and managing anemia. The plant is also rich in fiber (30) which makes it useful as a laxative, purgative and for improving digestion as reported in the present study. The plant has also been reported to be gastro-protective (31) which supports its use for managing gastrointestinal (GI) disturbances such as constipation, peptic ulcers, and 'heart burn'. The plant was also reported to aid in parturition. This was in accordance with the findings of a study conducted by Attah in Nigeria (32). The plant appears to stimulate smooth muscle contraction as can be noted in its ability to treat constipation, cause purgation and aid in parturition.

In Uganda (Bunyoro-kitara region), the vegetable is used to treat fresh wounds and cuts (33). However, only one person reported using *C. olitorius* L for wound treatment in the current study. This is possibly due to lack of awareness of its values in wound healing. Most of the study participants reported using the leaves whereas a few use fruits and seeds of the plant for the different medicinal applications. This is in line with other findings in Bangladesh (9) and in Benin (29). In this study, the leaves were often boiled and eaten as part of their daily food. The leaves and fruits may be dried as a mode of preservation for further use whereas the seeds are crushed to form a powder which is used as a herbal tea. This too agrees with the findings in Benin and Bangladesh (9, 29).

Results

A total of 239 out of 246 participants responded fully to the questionnaires giving a response rate of 97.15%. Most of the respondents (165 [69%]) were females, majority (76.7%) being in the age group 45-54 years, while 77 (32.2%) had no formal education and 218 (91%) were subsistence farmers.

Traditional medicinal uses of *Olitorius* in Oyam district

C. olitorius is a widely consumed green leafy vegetable that also has a variety of medicinal uses. We conducted a cross-sectional ethnobotanical survey among the community members of Oyam district to delineate the traditional medicinal uses of *C. olitorius*. From the data that was analyzed, most of the respondents (96.7%) stated that they use *C. olitorius* for consumption purposes. More than three quarters of the respondents (185, 77.4%) reported that they used *C. olitorius* for medicinal purposes. Out of those (77.4%), about two thirds (118, 63.78%) used it for the treatment of diseases related to musculoskeletal systems such as joint pain and stiffness, joint lubrication and strength, prevention and treatment of bone fractures as well as weak muscles. On the other hand, almost a third of the respondents (63, 34.05%) mentioned that they used plant for treating gastrointestinal system disorders such as constipation, ulcers, 'heart burn', hemorrhoids and poor appetite (Table 1).

Table 1: Traditional medicinal uses of *Corchorus olitorius* (N=185)

| Medicinal uses | Frequency | Percentage (%) |
|---|-----------|----------------|
| Musculoskeletal system | 118 | 63.78 |
| Joint pain and stiffness, Joint lubrication & strength, Prevent bone fracture in case of accident and enhance fracture healing, Bone pains, Muscle rigidity (contractures), Weak muscles & Waist pain during menstruation | | |
| Gastrointestinal system | 63 | 34.05 |
| Appetizer, Constipation, Heartburn, Ulcers, Purgation, Flatulence, Gastrointestinal obstruction, Hemorrhoids, Abdominal pain, Painful swallowing & Poor digestion | | |
| Reproductive system | 02 | 1.08 |
| Improve fetal health and Ease parturition | | |
| Cardiovascular system | 06 | 3.24 |
| Blood boosting (Anaemia), Relieves engorged blood vessels, Sickle cell disease & Relieves engorged blood vessels | | |
| Immune system | 03 | 1.62 |
| Low immunity especially in TB patients & Enhance recovery from sickness | | |
| Other uses | 10 | 5.41 |
| Headache, Malnutrition, Scabies, Smoothing rough voice, Mental problems, Poisoning, Poor vision & Wounds | | |

Source: Data from respondents (December, 2018)

Parts of *olitorius* used for medicinal purposes in Oyam district

The study also set out to find out which parts of *C. olitorius* were used by the study participants for the medicinal purposes. Findings from the data analyzed indicated that most of the study participants (88%) used the leaves of *C. olitorius*. (Table 2).

Table 2: Parts of *C. olitorius* used for medicinal purposes (N=185)

| Plant part used | Frequency | Percentage (%) | Source: Data from respondents (December, 2018) |
|------------------------|------------------|-----------------------|---|
| Leaf | 162 | 88 | Mode of preparation, route of administration & dosage of <i>olitorius</i> in Oyam district |
| Fruit | 21 | 11 | |
| Root | 2 | 1 | |
| Total | 185 | 100 | |

Another objective of the study was to find out the mode of preparation of the plant, routes of administration and the dosage used by the study participants. After analysis, the findings revealed that majority of the participants (182, 98%) boiled the plant before use while quite a few either crushed it or dried and made powder. On the matter of the route of administration and dosage, almost all respondents (184, 99.5%) stated that they ate as food. There was thus no specific quantifiable dosage (Table 3).

Table 3: Mode of preparation, route of administration & dosage (N=185)

| <i>C. olitorius</i> | Frequency | Percentage (%) | Source: Data from respondents (December, 2018) |
|---------------------------------------|------------------|-----------------------|---|
| <i>Mode of Preparation</i> | | | Discussion |
| Boil | 182 | 98 | |
| Crush fresh | 2 | 1 | |
| Dry & make powder | 1 | 1 | |
| Total | 185 | 100 | |
| <i>Route of administration</i> | | | |
| Oral | 184 | 99.5 | |
| Topical | 1 | 0.5 | |
| Total | 185 | 100 | |
| <i>Dosage</i> | | | |
| As food | 184 | 99.5 | |
| As drink | 1 | 0.5 | |
| Total | 185 | 100 | |

In this study, we set out to describe the traditional medicinal uses of *C. olitorius* by communities of Oyam district in Northern Uganda. Findings from the study reveal that the plant is a highly consumed vegetable as well as a medicine. The main traditional medicinal uses of *C. Olitorius* we identified were related to the musculoskeletal disorders (63.78%) and gastrointestinal abnormalities (34.05%). These medicinal uses included: joints pain and stiffness; bone pain and weakness; muscular rigidity; gastric ulcers, obstruction and constipation (table 1). The study participants reported using leaves for medicinal uses. They boiled and ate the leaves as food on a regular basis.

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Conclusions

In summary, *C. olitorius* has a variety of traditional medicinal values and is highly consumed in Oyam district, Northern Uganda. Interestingly, the major medicinal use of *C. olitorius* in the study area in the treatment of musculoskeletal ailments such as joint pain and stiffness, joint lubrication, prevention of bone fractures and muscle rigidity. The main parts of *C. olitorius* used for treatment purposes are the leaves which are boiled and eaten as food with no defined dosage. Despite the widespread medicinal use of *C. olitorius*, its mechanism of action is not understood. We recommend that the mechanism of action

of *C. olitorius* should be investigated and validated in order to inform any pharmaceutical development. Further ethnobotanical studies also need to be conducted in other regions of the country in order to provide a more comprehensive documentation of the plant's traditional medicinal uses.

Abbreviations

REC: Research and Ethics Committee

MUREC: Mbarara University Research and Ethics Committee

C. olitorius: *Corchorus olitorius* L

GI: Gastrointestinal

Declarations

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Authors' contributions

RN: Conceived the idea and spearheaded the study design and data collection, analyzed the data and made the first draft of the manuscript. SBA and MKA: Participated in data collection, analysis and manuscript writing; JOK and PA: Provided significant intellectual input and supervision right from inception of the idea, data collection and manuscript writing.

All authors read and approved the final manuscript.

Availability of data and material

The datasets generated and/or analyzed during the current study are not publicly available due to the fact that study is just a portion of a bigger academic study which is still ongoing. Data will be deposited in the Lira university repository upon completion of the study. However, the data can be provided by the corresponding author upon reasonable request.

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Ethics approval and consent to participate

The study was approved by the REC of Mbarara University of Science and Technology and the National council for Science and Technology. Permission to conduct the study was sought from the area local leaders before accessing the community. In addition, the study aims were thoroughly explained to the participants and their consent obtained by signing a consent form before interviews were conducted.

Consent for publication

Not applicable

Competing interests

The authors declare that there are no competing interests

References

1. Abascal K, Yarnell E. Botanical galactagogues. *Alternative and Complementary Therapies*. 2008;14(6):288-94.
2. Fabricant DS, Farnsworth NR. The value of plants used in traditional medicine for drug discovery. *Environmental health perspectives*. 2001;109(suppl 1):69-75.
3. Laird SA. *Biodiversity and traditional knowledge: equitable partnerships in practice*: Routledge; 2010.
4. Nelson-Harrison ST, King SR, Limbach C, Jackson C, Galiwango A, Kato SK, et al. Ethnobotanical research into the 21st century. *Advances in Phytomedicine*. 1: Elsevier; 2002. p. 283-307.
5. Ignacimuthu S, Ayyanar M. Ethnobotanical investigations among tribes in Madurai district of Tamil Nadu (India). *Journal of Ethnobiology and Ethnomedicine*. 2006;2(1):25.
6. Gautam AK, Bhatia MK, Bhadauria R. Diversity and usage custom of plants of western Himachal Pradesh, India-Part I. *Journal of Phytology*. 2011.
7. Loumerem M, Alercia A. Descriptors for jute (*Corchorus olitorius* L.). *Genetic resources and crop evolution*. 2016;63(7):1103-11.
8. Begum T, Kumar D. Usefulness of morphological characteristics for DUS testing of jute (*Corchorus olitorius* L. and *C. capsularis* L.). *Spanish journal of agricultural research*. 2011;9(2):473-83.
9. Islam MM. Biochemistry, medicinal and food values of jute (*Corchorus capsularis* L. and *C. olitorius* L.) leaf: A review. *Int J Enhanc Res Sci Technol Eng*. 2013;2(11):135-44.
10. Ssozi L, Kabiito B, Byaruhanga A, Kanata W. Documenting Baganda Ethno-medicine: A Step towards Preservation and Conservation. *Journal of Applied and Advanced Research*. 2016;1(2):15-22.
11. Tabuti JR, Kukunda CB, Kaweesi D, Kasilo OM. Herbal medicine use in the districts of Nakapiripirit, Pallisa, Kanungu, and Mukono in Uganda. *Journal of ethnobiology and ethnomedicine*. 2012;8(1):35.

12. Tugume P, Kakudidi EK, Buyinza M, Namaalwa J, Kamatenesi M, Mucunguzi P, et al. Ethnobotanical survey of medicinal plant species used by communities around Mabira Central Forest Reserve, Uganda. *Journal of ethnobiology and ethnomedicine*. 2016;12(1):5.
13. Namukobe J, Kasenene JM, Kiremire BT, Byamukama R, Kamatenesi-Mugisha M, Krief S, et al. Traditional plants used for medicinal purposes by local communities around the Northern sector of Kibale National Park, Uganda. *Journal of Ethnopharmacology*. 2011;136(1):236-45.
14. Musinguzi D, Tumushabe A, Sekabira K, Basamba TA, Byarugaba D. Medicinal plants use in and around kalinzu central forest reserve, Western Uganda. 2017.
15. Okello J, Ssegawa P. Medicinal plants used by communities of Ngai Subcounty, Apac District, northern Uganda. *African Journal of Ecology*. 2007;45:76-83.
16. Kamatenesi MM, Acipa A, Oryem-Origa H. Medicinal plants of Otwal and Ngai Sub Counties in Oyam District, Northern Uganda. *Journal of Ethnobiology and Ethnomedicine*. 2011;7(1):7.
17. Tabuti JR, Lye KA, Dhillion S. Traditional herbal drugs of Bulamogi, Uganda: plants, use and administration. *Journal of Ethnopharmacology*. 2003;88(1):19-44.
18. Oyam District Overview Oyam District Website2019 [Available from: <https://oyam.go.ug/lg/overview>].
19. UBoS. Oyam District. 2016.
20. Bamberger M. Integrating Quantitative and Qualitative Research in Development Projects: Lessons from the field: The World Bank; 2000.
21. Brannen J. Mixing methods: The entry of qualitative and quantitative approaches into the research process. *International journal of social research methodology*. 2005;8(3):173-84.
22. Taherdoost H. Sampling methods in research methodology; how to choose a sampling technique for research. *How to Choose a Sampling Technique for Research* (April 10, 2016). 2016.
23. Methodology S. Sampling methods and sample size calculation for SMART methodology. 2012.
24. Tai V, Leung W, Grey A, Reid IR, Bolland MJ. Calcium intake and bone mineral density: systematic review and meta-analysis. *Bmj*. 2015;351:h4183.
25. Domazetovic V, Marcucci G, Iantomasi T, Brandi ML, Vincenzini MT. Oxidative stress in bone remodeling: role of antioxidants. *Clinical Cases in Mineral and Bone Metabolism*. 2017;14(2):209.
26. Brain A, John M. Phenolic content and antioxidant activity of selected Ugandan traditional medicinal foods. *African Journal of Food Science*. 2014;8(8):427-34.
27. Owoyele BV, Oyewole AL, Alimi ML, Sanni SA, Oyeleke SA. Anti-inflammatory and antipyretic properties of *Corchorus olitorius* aqueous root extract in Wistar rats. *Journal of basic and clinical physiology and pharmacology*. 2015;26(4):363-8.
28. Alfred M. Traditional use of Medicinal plants in South–Central Zimbabwe. *Journal of Ethnobiology and Ethnomedicine*. 2013;46:678-98.
29. Adebo HO, Ahoton LE, Quenum FJ, Adoukonou-Sagbadja H, Bello DO, Chrysostome CA. Ethnobotanical Knowledge of Jute (*Corchorus olitorius* L.) in Benin. *European Journal of Medicinal Plants*. 2018:1-11.

30. Nlovu J, Afolayan A. Nutritional analysis of the South African wild vegetables *Corchorus olitorius* L. *Asian Journal of Plant Sciences*. 2008;6:615-8.
31. Al Batran R, Al-Bayaty F, Ameen Abdulla M, Jamil Al-Obaidi MM, Hajrezaei M, Hassandarvish P, et al. Gastroprotective effects of *C. orchorus olitorius* leaf extract against ethanol-induced gastric mucosal hemorrhagic lesions in rats. *Journal of Gastroenterology and Hepatology*. 2013;28(8):1321-9.
32. Ajagbonna O, Adeniran L, Lawal R. Ethnobotanical assessment of plants used to aid parturition in Abuja, Nigeria. *Sokoto Journal of Veterinary Sciences*. 2019;17(1):1-9.
33. Agea J, Okia C, Obua J, Hall J, Teklehaimanot Z. Wild and semi-wild food plants in Bunyoro-Kitara Kingdom, Uganda: cultural significance, local perceptions and social implications of their consumption. *International Journal of Medicinal and Aromatic Plants*. 2011;1(2):137-52.

Figures

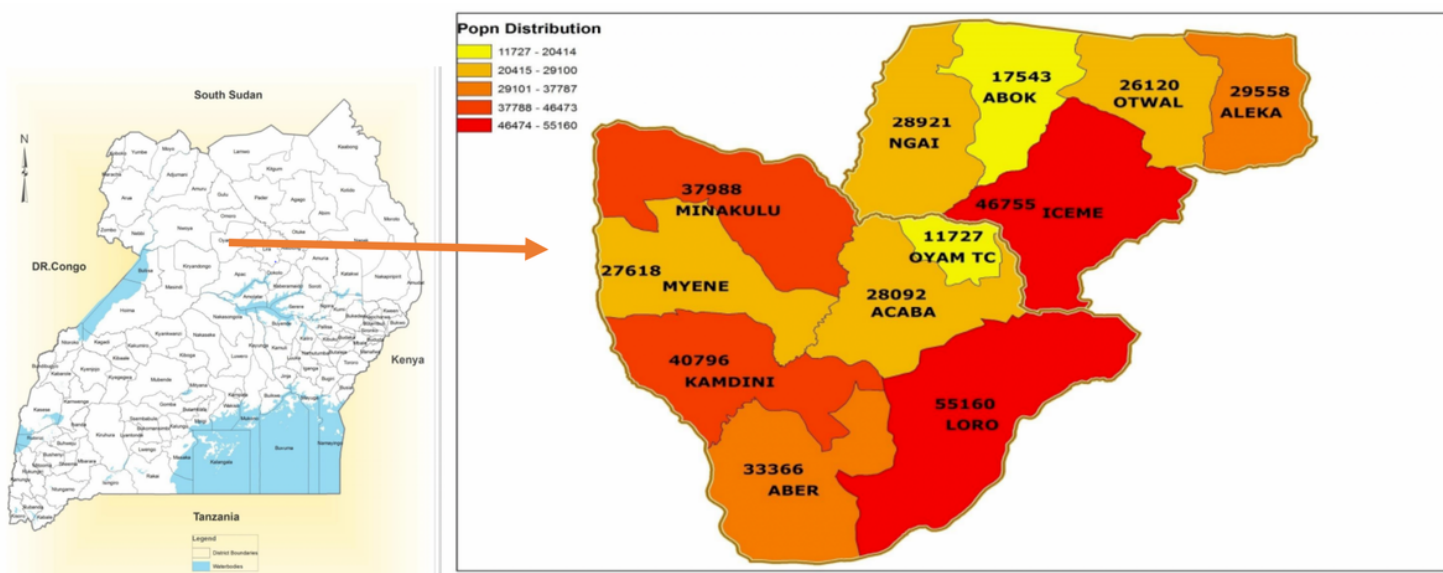


Figure 1

Map of Oyam district (19)