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Local perceptions of ginger (*Zingiber officinale* Roscoe) crop management in Burkina Faso

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Abstract

Ginger (*Zingiber officinale* Rosc., Zingiberaceae) is a highly profitable crop of great interest to growers and processors. However, there is an insufficiency of knowledge about the production practices implemented in the main production areas. This study described farmers' knowledge of ginger diversity, production constraints, tuber conservation and seed management practices in western Burkina Faso. This assessment was based on surveys conducted through individual interviews and group discussions. The results showed that ginger cultivation is mainly dominated by men (92.9%) aged between 20 and 80. In addition, six (6) major constraints to ginger production were identified, including the difficulty of acquiring quality seed rhizomes (31%), storing of rhizomes (25%) and irregular rainfall (18%). Furthermore, the majority of ginger producers don't know the existence of different varietal types among the gingers they produced. Only 3.57 % of them can distinguish some recognition criteria in terms of the shape of the rhizomes and the size of the sections (or "fingers"), the shape of the leaves, the color of the flowers, the color of the epidermis and the flesh of the rhizome and even the taste. However, these characteristics are not always considered when selecting seed for production.

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Introduction

Ginger (*Zingiber officinale* Rosc.), a species of the Zingiberaceae family, is a rhizome plant that is widely consumed throughout the world. It is an important cash crop whose aromatic rhizomes are used as a spice for both food and medicinal purposes (Mao *et al.*, 2019; Meenu and Jebasingh, 2020; Pinson, 2012). It contains more than 400 active compounds with complementary or synergistic therapeutic activities (Ali *et al.*, 2008; IESV, 2015). The species therefore represents an added value in world trade (Kaushal *et al.*, 2017).

In Burkina Faso, ginger is widely consumed as a drink (juice), as an infusion or as a supplement to other preparations such as tea, porridge and often used as a spice to enhance dishes. However, ginger remains a minor crop in Burkina Faso, as it is only produced in a small part of the country. It is cultivated in the Hauts-Bassins and Cascades regions and is gradually being introduced in the south-west and other regions of Burkina Faso (DGPER, 2020; Nandkangre *et al.*, 2015). Therefore, this spice is one of the plant species whose cultivation is emerging in the country and whose development requires a good knowledge of its assets.

Although statistics on ginger production are limited to a few villages in the producing regions, it is known to occupy an important place among crops of high economic value due to its many outlets (MAAH, 2018). Ginger would provide a more substantial income to producers if they were able to achieve good yields. However, the local ginger sector appears to be characterised by low productivity, the causes of which need to be understood in order to develop mitigating solutions. The aim of this study is to contribute to a better understanding of farmers' knowledge and practices related to the production and management of ginger genetic resources in western Burkina Faso.

Materials and methods

Description of the study area

The study was carried out in western Burkina Faso in the Cascades and Hauts-Bassins regions, involving three provinces: Comoé, Léraba and Kénédougou. These are the main ginger production areas in Burkina Faso. They are located in the Sudanian zone of the country, which is generally characterised by high inter-annual and spatio-temporal variability.

This is the country's wettest zone. Annual rainfall exceeds 1,100 mm. The rainy season lasts 5 to 6 months and average annual temperatures range from 20 to 25°C. Soils are variable, with four textures to be found: (i) gravelly, (ii) clayey, (iii) clayey-sandy to clayey at the surface, (iv) silty-clayey to clayey at depth and clay-loamy at the surface (PCD, 2018).

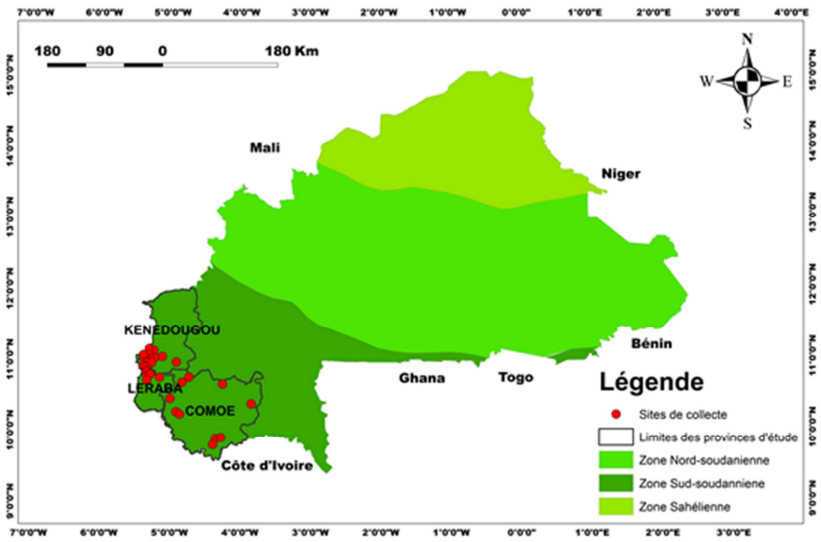

Fig. 1. Map showing the location of survey sites and ginger sample collection sites

Survey site selection criteria and data collection methodology

A total of 30 production sites (Fig. 1) were surveyed. These sites were selected on the basis of preliminary surveys conducted with resource persons, traders, processors and the decentralised structures of the Ministry of Agriculture (MAAH), namely the Directorate General for the Promotion of the Rural Economy (DGPER) and the General Directorate for Plant Protection (DGPV). A questionnaire was prepared for discussion with producers in the various localities, at home or in their fields, and with traders in a number of markets. The main survey tool was the semi-structured interview, which was conducted individually or in groups and involved both male and female stakeholders. The data was collected during the period from November 2020 to January 2021, taking into account the ginger cultivation calendar. For most producers, this period corresponded to the ginger harvest. This was propitious for the exchanges. The number of growers surveyed per site varied from three (3) to eight (8). The information gathered mainly concerned socio-demographic aspects, production difficulties, selection criteria, storage methods and the level of involvement of women in the production process.

Statistical analysis

The survey data were entered and organised using Excel 2010 software. These data were subjected to descriptive statistical analyses, and the quantitative variables were described using averages. Qualitative variables were described using headcounts and percentages. The various results obtained were represented in the form of graphs and tables.

Results

Socio-demographic characteristics of production

The growers surveyed were 92.9% male and 7.1% female (Fig. 2), aged between 20 and 80 (Fig. 3). They had been growing ginger for between one (1) and more than 40 years, and most were illiterate. Most of the growers surveyed belong to the Sénoufo socio-cultural group (77.38%), the others being Dioula (7.14%), Dôgôssè (3.57%), Mossi (2.38%), Siamou (2.38%), Turka, Lobi, Kômônô, Gouin, Dafing and Bobo (1.19% each). Ginger production is mainly rain-fed in Burkina Faso. It is one of the first crops to be sown, but one of the last to be harvested. Ginger is produced for self-consumption (family use) (4.76%) and mainly for sale on local and regional markets (85.71%). Some growers (9.52%) grow it for both commercial and family reasons.

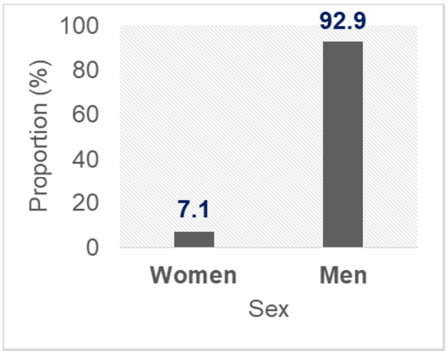

Fig. 2. Distribution of producers by gender

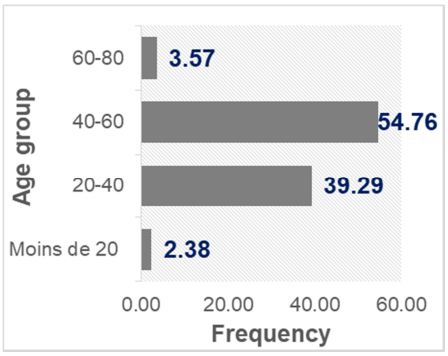

Fig. 3. Distribution of producers by age group

Ginger production constraints

The constraints linked to ginger production are practically similar in all the production zones surveyed (Fig. 4). Generally speaking, the survey revealed that growers were unfamiliar with and/or had no mastery of good ginger-growing practices. In addition, they were confronted with difficulties relating mainly to the acquisition of quality material (rhizome seeds) (31%) and their conservation (25%). Indeed, according to these growers, despite the existence of various traditional methods of conservation, these entail risks of loss of seed quality and quantity. In addition, irregular rainfall during the ginger growing cycle (18%), the presence of diseases

often unknown to growers (11%), unstable selling prices (9%) and the high cost of inputs (6%) were identified as the source of problems selling the produce.

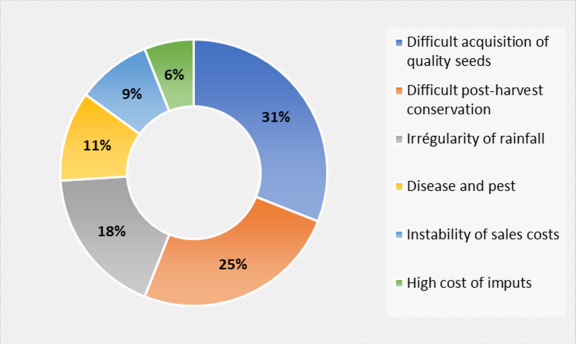

Fig. 4. Main constraints to ginger production in Burkina Faso

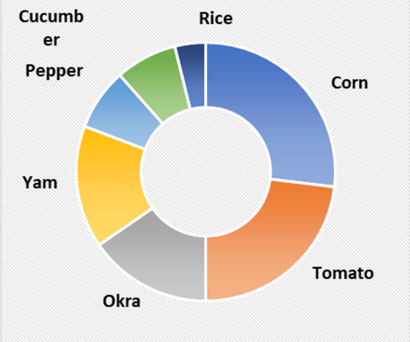

Fig. 5. Frequency of crop species associated with ginger

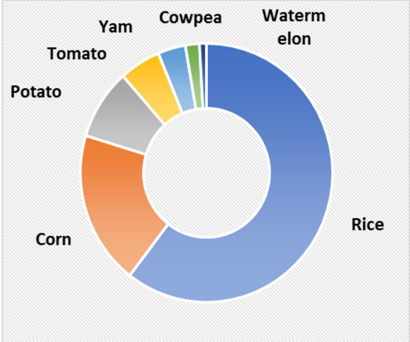

Fig. 6. Frequency of crop rotation with ginger

Growing systems and harvesting period for ginger

The survey revealed that 15.5% of the growers interviewed in the three (3) provinces surveyed - combine other species in their ginger fields, compared with 84.5% who grow ginger purely as a monocrop, some of whom rotate different crops from one production year to the next. Specifically, the main crops grown in association with ginger are: maize (26.95%), tomato (23.1%), okra (15.4%), yam (15.4%), cucumber (7.7%), chilli pepper (7.7%) and rice (3.85%) (Fig. 5). The crops used in rotation in ginger plantation fields are: rice (60.56%), maize (19.31%), potato (8.8%), yam (3.55%), tomato (5.3%), cowpea (1.8%), watermelon (0.9%) (Fig. 6).

As for the growing season, growers start sowing as soon as the first rains fall in April. Some plant earlier in March and later in July. Depending on the grower's needs, there may be several harvests, the earliest of which takes place in the 4th month after planting. The production cycle thus varies from four (4) (1.2%) to ten (1.2%) months after sowing, with an average cultivation period of seven (7) months (Fig. 7).

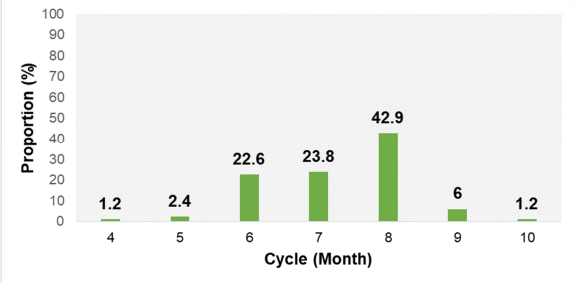

Fig. 7. Ginger production cycles as reported by producers

Farmers' knowledge of ginger genetic variability

The survey revealed that most ginger growers were unaware of the existence of different varietal types among the ginger they produced. Over 96% of growers said that there was only one type of ginger variety in Burkina Faso. On the other hand, the other 3.57% acknowledged that there were some differences in the shape of the rhizomes and the size of the sections or 'fingers', the shape of the leaves, the colour of the flowers, the colour of the skin, the flesh of the rhizome and the taste.

Farm management of ginger seeds

Seed acquisition and selection criteria for growers

There are currently no suppliers of certified ginger seed in Burkina Faso. The seeds are mainly self-produced (67.15%), using apparently healthy rhizomes from their own plantations. Producers

therefore have no phytosanitary control over their seeds. The survey also identified other methods of acquiring seed, such as purchase between growers or on the local market (27.31%), donation (2.8%) and inheritance (2.4%) (Fig. 8).

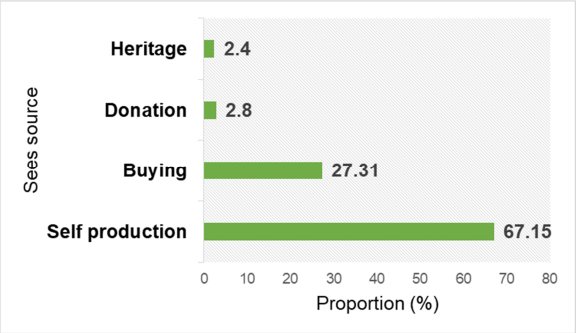

Fig. 8. Seed acquisition methods for ginger production in Burkina Faso

Farming practices for rhizome conservation

Overall, 5 methods of storage were identified among the producers surveyed (Fig. 9). These were storage in pits prepared for this purpose (Fig. 9A.), in storage huts (Fig. 9B), in piles under mulch (Fig. 9C), on ridges directly in the field (Fig. 9D) and in bags simply in the shade. Of these conservation methods, the use of pits is the most common (55.95%) among growers, some of whom (8.33%) keep the rhizomes after maturity in the field on straw-covered ridges. Other growers keep their seeds in dedicated huts (4.76%), in piles of rhizomes covered with mulch under shade (2.38%), or simply in bags (2.38%) stored under shade. In addition, some growers use both methods of storage. For example, 11.90% of producers use both field and pit storage, and 13.10% use both pit and hut storage. On the other hand, a minority of growers (1.19%) do not use any of these conservation methods, as they sell all their production at the end of the season and replenish their seed supplies at the start of each production season. These different storage methods were common to all the ethnic groups in the three provinces studied. However, the length of storage depended on the method used (Fig. 10). The general observation was that storage in the field under the ground and covered with straw was the most effective (7 months), compared with simple storage in huts or bags, which did not allow the rhizomes to last more than 3.5 months.

Fig. 9. Main traditional methods of storing ginger A: storing ginger in a pit under shade; B: storing ginger in a hut; C: storing ginger in a heap under shade; D: storing ginger in the field on ridges

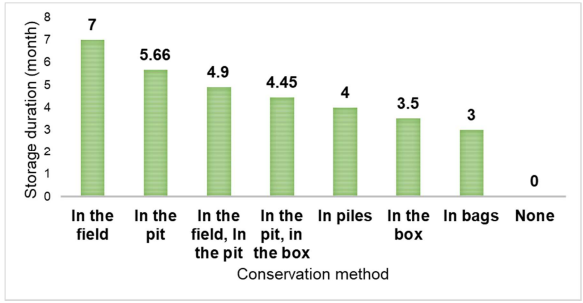

Fig. 10. Estimated conservation period for ginger based on the method used

Pest and disease management

With regard to pests and diseases associated with ginger cultivation, growers described a few symptoms of early yellowing of leaves, brown spots, leaf holes or the presence of whitish, powdery traces reminiscent of fungi on leaves and rhizomes. To combat attacks by pathogens and other pests, 22.22% of growers use synthetic chemical insecticides (Permethrin) or fungicides (Decis or Red Caiman) to prevent or mitigate damage. However, this application is generally poorly controlled. On the other hand, the majority of growers (77.78%) do not apply any phytosanitary treatments.

Impact of women on ginger production and other stages of the production chain

Women's involvement in ginger production appears to be marginal. There are a handful of women who

own ginger fields but whose farms are run by young men whom they employ.

However, although the results of the survey showed that 22.6% of producers do not require women to participate in the various ginger production activities, 26.2% of them entrust post-harvest tasks to women (Fig. 11). In this case, they are responsible for collecting the harvested rhizomes, putting them in piles and then removing the roots, stems and leaves (Fig. 11) and helping with storage. In addition to this, they are mainly involved in processing (6%) and marketing rhizomes (1.2%). In this respect, different levels of involvement were noted and recorded in Fig. 11.

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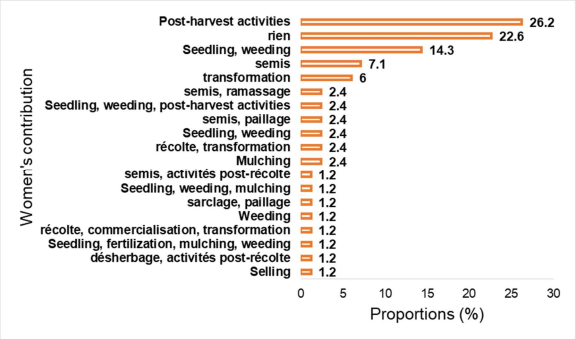

Fig. 11. Women's contribution to ginger production and preservation activities

Knowledge on the processing and uses of ginger

There are an increasing number of products derived from ginger on the Burkina Faso market. However, processing is still artisanal (powder, juice, pastilles, granules) or semi-industrial (syrup, infusion, beer, essential oil). Most of the people involved are associations, community centres, restaurants, kiosks, hotels and households. Ginger is known to have many uses as a rhizome, either fresh or processed for consumption. It is used as a supplement in the preparation of porridge, sauces and other dishes, tea or other juices such as pineapple or bissap, for its revealing flavour. In addition, some consumers said they used ginger as an infusion or decoction to relieve the effects of certain illnesses such as coughs, colds, bloating, gastric reflux, etc. Other respondents said they used ginger as an infusion or decoction to relieve the effects of certain illnesses such as coughs, colds, bloating, gastric reflux, etc. Other respondents said they could use fresh rhizome grinds as a purgative to alleviate the effects of haemorrhoids, constipation and rheumatism, etc. The aphrodisiac effect of ginger was also mentioned by users during the survey.

Discussion

The lack of scientific information on the local characteristics of ginger cultivation is a handicap to its development. This survey of ginger growers described endogenous knowledge of rhizome production and conservation.

Men are the main actors in ginger production. The arduous task of preparing the fields (clearing, ploughing, making ridges, etc.) is clearly one that falls to them. Although there is no division of labour, women are very involved in sowing, applying fertiliser, weeding, collecting and transporting rhizomes after harvest, sorting and cleaning for storage. These women also process ginger into by-products (syrup, juices and chips, etc.), the sale of which represents a potential source of income improvement for them. These tasks are carried out by hand or using rudimentary tools. While they do not necessarily require physical strength, they can be time-consuming.

According to most of the growers we met, ginger is planted as soon as the rains begin, well before the other major crops (cereals, oilseeds, etc.), but is one of the last to be harvested. This timing seems to be a choice made by the grower in planning his agricultural activities, given the long cycle of the species. Given ginger's water requirements, it is essentially a rainfed crop in Burkina Faso. Sowing is timed to coincide with the start of the rains, so that the duration of the rains can cover and ensure good development of the plants until tuberisation, when the need for water diminishes while waiting for the rhizomes to ripen and complete the cycle. In addition, the field storage capacity of rhizomes allows flexibility during harvest periods (Nteranya and Adiel, 2015). However, ginger can also be grown under irrigation

(Parthasarathy *et al.*, 2012). But water sources may be limited. Strengthening technical and material capacities to set up hydro-agricultural development systems in this way could facilitate cultivation in both wet and dry seasons and help to further improve ginger yields.

On the other hand, the main constraints hindering ginger production relate to the acquisition of quality material and their conservation knowing that ginger seeds largely come from the producer's personal stock. Contrary to this result, (Nandkangre *et al.*, 2015) described purchasing as the main means of obtaining material. Therefore, growers can manage their stocks more rationally in order to guarantee sufficient seed for the next season. But this situation varies from year to year. Yet seed is one of the main determinants of agricultural yields (Turner, 2010). As a result, once their quality is questionable, the expected potential is no longer achieved. The early depletion of self-propagated stocks, coupled with the availability of off-the-shelf material or material of dubious origin on the market at a generally higher cost, could well lead to a deterioration in access to quality seed (Djaha *et al.*, 2017). As a crop of secondary importance, research into the selection and genetic improvement of ginger is almost non-existent in Burkina Faso. As a result, ginger seed selection is still carried out by farmers (APN-Sahel, 2017). Managing ginger conservation remains a challenge for ginger growers.

The methods used in pits and in the field on ridges seem to be the most effective for optimum storage time, even if they do not always enable the viability of the seeds to be fully maintained until their next use. Ginger productivity depends on the effectiveness of the rhizome storage method used. According to (Gerbaud, 2008) and (Sharma, 2017), these traditional techniques do not ensure the long-term integrity of the rhizomes. Proper storage could prevent fungal attack, rhizome desiccation or rotting due to excess water, or physiological exhaustion of the seeds due to tissue degeneration. This could ensure that the rhizomes sown have good germination capacity (Parthasarathy *et al.*, 2012).

Generally speaking, the diversity of ginger grown in Burkina Faso is not well perceived by its producers. In all cases, the common finding was that growers did not generally show a varietal preference. As for agronomic criteria such as earliness, resistance/susceptibility to disease, etc., these growers were not yet able to distinguish any difference in behaviour in their plantations. However, agronomic characteristics such as the morphotype's ability to resist attack by parasites and diseases, taste quality, rhizome colour and shape could be implicitly associated with identification criteria whose variation could be specific to a given morphotype or to its growing and storage environment (Desclaux *et al.*, 2014, 2009; Robert *et al.*, 2003). Hence, these morphological criteria for varietal recognition could facilitate a classification of the types found pending future selection studies (Belattar, 2018).

The instability of ginger retail prices, although not the main obstacle identified in this study, could also have a negative impact on production. It is a source of poor sales, since prices are often derisory depending on the period (financial needs) and the type of customer, whether retailer or wholesaler. Nevertheless, ginger is a crop with a high economic value (Acharya *et al.*, 2019), as it generates income and helps to alleviate household poverty and improve socio-economic status. But the ginger sector is not well organised, and production is too limited to be exported properly. The lack of coordination between the actors and of a collective strategy is affecting the visibility of the products.

Conclusion

Ginger is mainly grown under rainfed conditions in Burkina Faso. It is grown pure, often in rotation or in association with other species of interest to growers. Several factors hamper ginger production. Growers are poorly informed about the occurrence and recognition of diseases and pests on their plots. This situation highlights the need to raise awareness and train stakeholders in good production practices, disease recognition and management, conservation methods and the marketing of harvested products. To this end, managing these constraints would be a better approach to efficient and economically sustainable ginger

production and help solve food and nutritional security problems. This study therefore highlights the need to set up a collection that would be used to clearly identify the key selection criteria for developing new varieties adapted to the needs of growers in terms of improved productivity and earliness, and of their customers (traders, processors, consumers).

The results will eventually be used to lay the basis for a ginger genetic improvement program, and to promote and conserve ginger genetic resources in Burkina Faso.

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References

Acharya N, Acharya B, Dhungana SM, Bist V. 2019. Production economics of Ginger (*Zingiber officinale* Rose.) in Salyan district of Nepal. Archives of Agriculture and Environmental Science **4**, 424–427. https://dx.doi.org/10.26832/24566632.2019.040408.

Ali BH, Blunden G, Tanira MO, Nemmar A. 2008. Some phytochemical, pharmacological and toxicological properties of ginger (*Zingiber officinale* Roscoe): A review of recent research. Food and Chemical Toxicology **46**, 409–420. https://doi.org/10.1016/j.fct.2007.09.085/.

APN-Sahel. 2017. Rapport d'évaluation de la sécurité semencière: étude de cas de Gargaboulé (Rapport d'enquête). Burkina Faso, 64p.

Belattar R. 2018. Application des marqueurs moléculaires à la gestion des ressources génétiques d'une accession de blé dur algérien (*Triticum durum* Desf.). Doctorat en sciences, Université Des Frères Mentouri Constantine 1, République Algérienne Démocratique et Populaire, 188 p.

Desclaux D, Chiffoleau Y, Nolot, JM. 2014. Coévolution des notions de Génotype, d'Environnement et de leurs interactions : approche participative et pluridisciplinaire. Agronomie, Environnement et Société **4**, 75–84.

Desclaux D, Nolot JM, Chiffoleau Y. 2009. La sélection participative pour élaborer des variétés de blé dur pour l'agriculture biologique. Innovations Agronomiques, INRA **7**, 65–78, hal-02656236.

DGPER. 2020. Rapport diagnostic de la filière gingembre et ses chaînes de valeur. MAAH, Burkina Faso, 147 p.

Djaha KE, Abo K, Bonny BS, Kone T, Amouakon WJL, Kone D, Kone M. 2017. Caractérisation agromorphologique de 44 accessions de manioc (*Manihot esculenta* Crantz) cultivés en Côte d'Ivoire. International Journal of Biological and Chemical Sciences **11**, 174. https://doi.org/10.4314/ijbcs.v11i1.14.

Gerbaud P. 2008. Les petits exotiques. CIRAD-Fruitrop **160**, 16-17.

Kaushal M, Gupta A, Vaidya D, Gupta M. 2017. Postharvest Management and Value Addition of Ginger (*Zingiber Officinale* Roscoe): A Review. International Journal of Environment, Agriculture and Biotechnology **2**, 397–412. https://doi.org/10.22161/ijeab/2.1.50.

MAAH, 2018. Guide de production du gingembre (*Zingiber officinale* Roscoe). p. 29.

Mao QQ, Xu XY, Cao SY, Gan RY, Corke H, Beta T, Li HB. 2019. Bioactive Compounds and Bioactivities of Ginger (*Zingiber officinale* Roscoe). Foods **8**, 185. https://doi.org/10.3390/foods8060185.

Meenu G, Jebasingh T. 2020. Diseases of Ginger. In: Ginger Cultivation and Its Antimicrobial and Pharmacological Potentials. IntechOpen, 31p. https://doi.org/10.5772/intechopen.88839.

Nandkangre H, Ouedraogo M, Sawadogo M. 2015. Caractérisation du système de production du gingembre (*Zingiber officinale* Rosc.) au Burkina Faso : Potentialités, contraintes et perspectives. International Journal of Biological and Chemical Sciences **9**, 861-873. https://doi.org/10.4314/ijbcs.v9i2.25.

Nteranya S, Adiel M. 2015. Racines et Tubercules (Manioc, Igname, Pomme de Terre et Papate Douce), 35p.

Parthasarathy VA, Srinivasan V, Nair RR, Zachariah TJ, Kumar A, Prasath D. 2012. Ginger: Botany and Horticulture. In: Janick, J. (Ed.), Horticultural Reviews. John Wiley & Sons, Inc., Hoboken, NJ, USA, pp. 273–388. https://doi.org/10.1002/9781118100592.ch7.

Pinson C. 2012. Gingembre et curcuma: un concentré de bienfaits pour votre santé et votre beauté, Editions Eyrolles, Paris.

Robert T, Ali K, Allinne C, Beidari Y, Bezançon G, Cayeux S, Couturon E, Dedieu V, Moussa D, Sadou MS, Seydou M, Seyni O, Tidjani M, Sarr A. 2003. Gestion de la diversité en milieu paysan: influence de facteurs anthropiques et des flux de gènes sur la variabilité génétique des formes cultivées et spontanées du mil (*Pennisetum glaucum* ssp. *glaucum* et ssp. *monodii*) dans deux localités du Niger. Actes BRG, 223–245.

Sharma Y. 2017. Ginger (*Zingiber officinale*)-An elixir of life a review. The Pharma Innovation Journal **6**, 22–27.

Turner M. 2010. Seeds, Éditions Quæ, CTA, Presses agronomiques de Gembloux. ed. CTA; Macmillan, Wageningen, Netherlands, Oxford, England. 227.