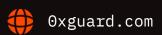


# Smart contracts security assessment

Final report

**Atropine** 

October 2023





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# □ Introduction

The report has been prepared for **Atropine**.

The audited project is Masterchef-like farm minting ERC20 token as a reward.

The PineToken contract includes pre-mint in the constructor.

The MasterChef contract charges a pool-specific fee on both deposit and withdrawal.

The code is available at the @MathAsgard/AtropineContracts Github repo and was audited in the <a href="https://example.com/972a3e4">972a3e4</a> commit.

The updated code was rechecked after the commit <a href="77aa37e">77aa37e</a>.

Name	Atropine
Audit date	2023-10-03 - 2023-10-05
Language	Solidity
Platform	Pulse Chain

# Contracts checked

Name	Address

PineToken

MasterChef

# Procedure

We perform our audit according to the following procedure:

# **Automated analysis**

- Scanning the project's smart contracts with several publicly available automated Solidity analysis tools
- Manual verification (reject or confirm) all the issues found by the tools

#### **Manual audit**

- Manually analyze smart contracts for security vulnerabilities
- Smart contracts' logic check

# Known vulnerabilities checked

Title	Check result
Unencrypted Private Data On-Chain	passed
Code With No Effects	passed
Message call with hardcoded gas amount	passed
Typographical Error	passed
DoS With Block Gas Limit	passed
Presence of unused variables	passed
Incorrect Inheritance Order	passed
Requirement Violation	passed
Weak Sources of Randomness from Chain Attributes	passed
Shadowing State Variables	passed
Incorrect Constructor Name	passed
Block values as a proxy for time	passed
Authorization through tx.origin	passed
DoS with Failed Call	passed
Delegatecall to Untrusted Callee	passed

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Use of Deprecated Solidity Functions passed **Assert Violation** passed State Variable Default Visibility passed Reentrancy passed <u>Unprotected SELFDESTRUCT Instruction</u> passed **Unprotected Ether Withdrawal** passed Unchecked Call Return Value passed Floating Pragma passed **Outdated Compiler Version** passed Integer Overflow and Underflow passed Function Default Visibility passed

# Classification of issue severity

**High severity** High severity issues can cause a significant or full loss of funds, change

of contract ownership, major interference with contract logic. Such issues

require immediate attention.

**Medium severity** Medium severity issues do not pose an immediate risk, but can be

detrimental to the client's reputation if exploited. Medium severity issues may lead to a contract failure and can be fixed by modifying the contract

state or redeployment. Such issues require attention.

**Low severity** Low severity issues do not cause significant destruction to the contract's

functionality. Such issues are recommended to be taken into

consideration.

## Issues



#### **High severity issues**

#### 1. Mint is open for owner (PineToken)

Status: Fixed

The contract owner can mint an arbitrary number of tokens alongside the typical minter MasterChef contract.

```
function mint(uint256 amount) public onlyOwner returns (bool) {
    _mint(_msgSender(), amount);
    return true;
}

function mint(address _to, uint256 _amount) public {
    require(msg.sender == minter, "PINE: Permission declined");
    _mint(_to, _amount);
}
```

**Recommendation:** Remove owner minting or secure ownership by transferring it to a well-known contract, e.g., Timelock with Multisig admin.

## 2. Owner controls emission rate (MasterChef)

Status: Open

The reward emission rate is calculated using the PinePerBlock, stakingPercent and BONUS\_MULTIPLIER variables. PinePerBlock and BONUS\_MULTIPLIER are updatable by the contract owner without any safety restrictions. This allows owner to increase emission rate to absurdly high value to receive massive reward in a single block and manipulate the PineToken's price on DEX.

**Recommendation:** Add safety limit to reward emission rate.

## 3. Owner can steal user's funds (MasterChef)

Status: Fixed

The migrate function calls for migrator contract, which is controlled by the owner. It also approves migrator to access all staked funds from selected pool. This means that owner is able to transfer all

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staked funds to an arbitrary address without user's permission.

```
function setMigrator(IMigratorChef _migrator) public onlyOwner {
    migrator = _migrator;
}

// Migrate lp token to another lp contract. Can be called by anyone. We trust that
migrator contract is good.
function migrate(uint256 _pid) public {
    require(address(migrator) != address(0), "migrate: no migrator");
    PoolInfo storage pool = poolInfo[_pid];
    IERC20 lpToken = pool.lpToken;
    uint256 bal = lpToken.balanceOf(address(this));
    lpToken.safeApprove(address(migrator), bal);
    IERC20 newLpToken = migrator.migrate(lpToken);
    require(bal == newLpToken.balanceOf(address(this)), "migrate: bad");
    pool.lpToken = newLpToken;
}
```

Function migrate is not going to work as expected in general. Requirement of balance equality for different LP tokens before and after switching DEX is very strict condition which is hard to meet.

**Recommendation:** Remove migrate function.

#### **Medium severity issues**

## 1. Duplicated pools are not supported (MasterChef)

Status: Fixed

Pools with the same staking token should be avoided by the contract owner. Such pools receive lower reward than it should be because the updatePool function calculates the pool supply as pool.lpToken.balanceOf(address(this)) which is incorrect in case of duplicated pools.

**Recommendation:** Consider storing pool's 1pSupp1y in the PoolInfo struct.

#### Low severity issues

#### 1. Irrelevant comment (PineToken)

Status: Fixed

The L875 comment with @notice description is misplaced and should be moved to the description of the mint function.

// @notice Creates `\_amount` token to `\_to`. Must only be called by the minter (MasterChef).

#### 2. Typos (PineToken)

Status: Fixed

Typo in 'adysd' (L921).

#### 3. Typos (MasterChef)

Status: Fixed

Typos in 'avaliable', 'vairables', 'alrady'.

### 4. Constant variables (MasterChef)

Status: Fixed

Some variables (PINE, stakingPercent, devPercent, percentDec, startBlock) are constant or immutable and should be marked with an appropriate keyword and named according to the Solidity naming conventions.

## 5. Non-standard tokens aren't supported (MasterChef)

Status: Open

Tokens with transfer hooks and tokens with transfer tax are not supported and must be avoided by the owner.

Tokens with transfer hooks are susceptible to reentrancy problem. Tokens with transfer tax are not checked during the deposit.

#### 6. Division before multiplication (MasterChef)

Status: Fixed

Division before multiplication reduces precision of calculations.

```
function updatePool(uint256 _pid) public {
    ...
    uint256 PineReward = multiplier.mul(PinePerBlock).mul(pool.allocPoint).div(totalAllocPoint).mul(stakingPercent).div(percentDec);
    ...
}
```

Also, the total emission rate is calculated as PinePerBlock \* BONUS\_MULTIPLIER \* stakingPercent / percentDec. It can be reduced to a single PinePerBlock.

# **○** Conclusion

Atropine PineToken, MasterChef contracts were audited. 3 high, 1 medium, 6 low severity issues were found.

2 high, 1 medium, 5 low severity issues have been fixed in the update.

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